International Edition

August 1984 Issue #287
$2.50 USA/$3.00 Canada

73 T.M.

Amateur Radio's Technical Journal

A CWC/I Publication

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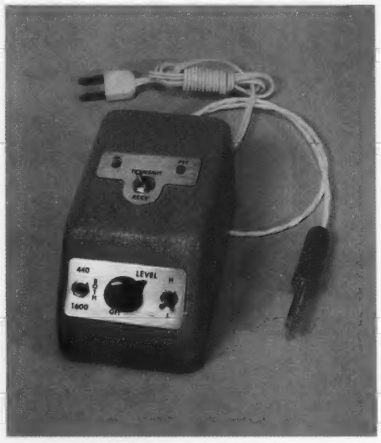

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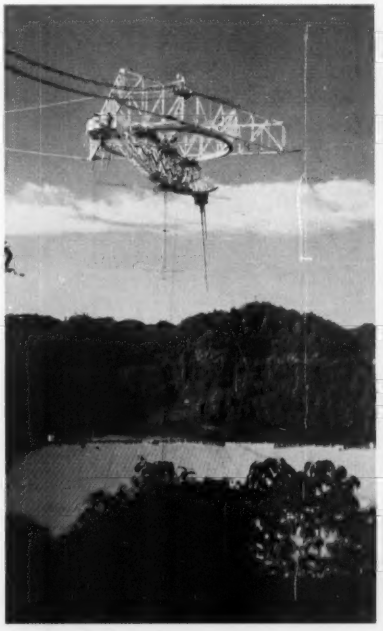

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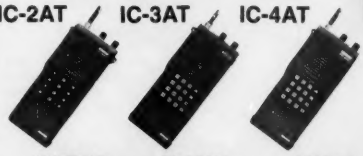

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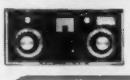

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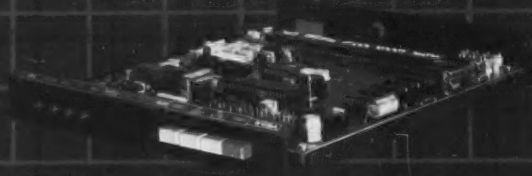

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Circulation Offices:

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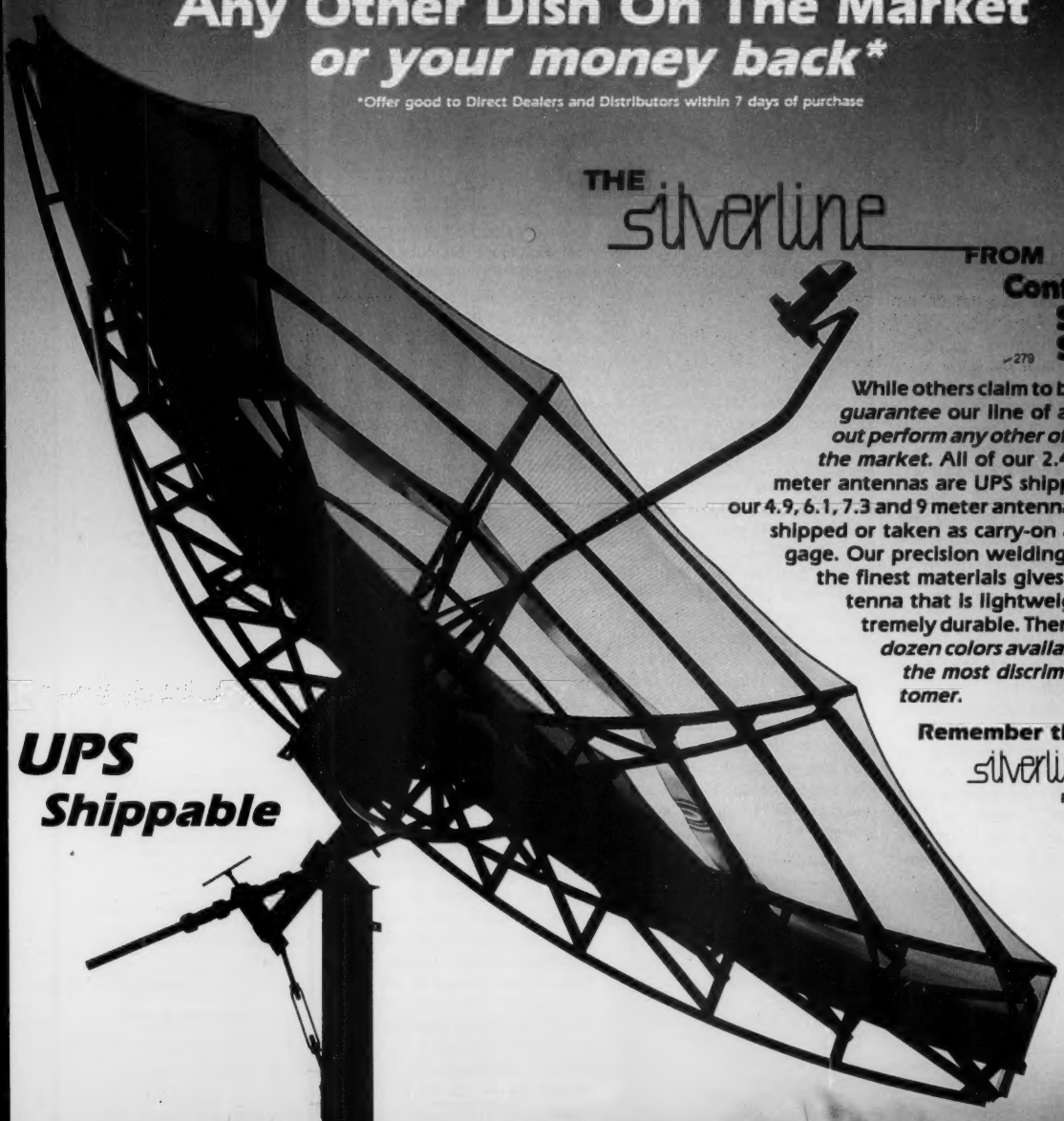

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W2NSD/1 NEVER SAY DIE

ARE YOU GAME?

If you're into DXing, you've read about the two recent DXpeditions to the Republic Of China (Taiwan). One was Italian and the other Japanese...so I wasn't completely surprised when Tim Chen BV2A, for years the only licensed amateur on Taiwan, suggested that it was getting to be time for an American DXpedition to BV.

Tim talked to me while I was attending a computer show in Taipei. BV is still relatively rare, so I agreed that such an operation would be great fun...an opportunity for some American hams to experience the excitement of being on the business end of a DXpedition...but without the miseries you often have to go through.

Taiwan is a fantastic place to visit. There are friendly people, great food, incredibly low prices, and amazing sights. Even though I get there once or twice a year, I always look forward to it and enjoy it. I'd sure like to get you to Taipei for a few days; you'd love it. It would be a DXpedition you'd remember the rest of your life. Before I go into details on the DXpedition, let me tell you how I happened to be visiting Tim.

Commerce Tours runs a two-week trip every spring which coincides with computer shows in Tokyo, Seoul, and Taipei. Since it's important for me to keep up with micro developments worldwide, I try to make this tour. Also, this time I was looking for some computer products which I might be able to import.

Commerce was able to let me start a day late on the trip so that I could get an honorary doctorate degree and give the commencement address at Central New England College in Worcester, Massachusetts. Readers of my editorials will not be surprised to learn that I gave a talk on my favorite subject: how you, yes you, can get rich. It seemed like a good message for the graduating class of this outstanding college.

I was a bit intimidated when I saw that my commencement predecessors had been Ted Turner, Bob Hope, Malcolm Forbes, and Frank Perdue. While I hadn't heard their talks, I felt that mine might be of more personal importance to the graduates and certainly right in line with the school motto: "Yes, You Can!" It came off fine and the resulting enthusiasm got me started on an "I Can" book during my Asian trip; I wrote on my lap computer during flights, in waiting rooms, and on buses.

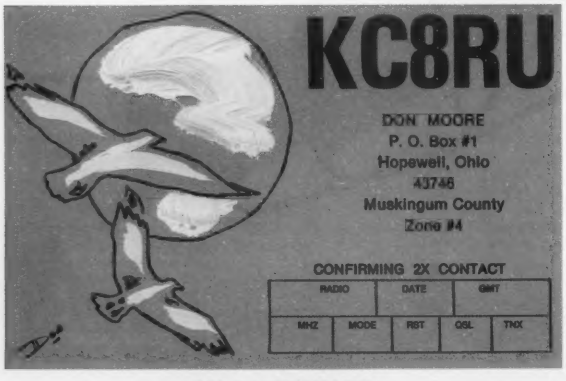
When the graduation ceremonies were done I was whisked to the airport for a flight to Los Angeles...and then Tokyo. There, we went to both a microcomputer show and an office-automation show, getting a full dose of both the low and high end of Japanese microcomputers.

The next step was Seoul, where the shopping is great if you like $9.00 New Balance sneakers and $10.00 Hang Ten suitcases, but it was a bomb for computers. An American outfit had taken over the yearly computer show and apparently alienated just about everyone. I think the whole show took less than ten minutes to see. The hundreds of small Korean computer firms passed it by. This was hard on our group, many of whom had rather good budgets for buying computer products for US distribution. Oh well, maybe we would do better in Taipei.

We did indeed. The Taipei computer show had over 200 exhibitors and much business was done. I got some excellent quotes on products I want to have made.

No trip to Taiwan is complete without an update on the ham

Continued on page 74



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TM-201A/TM-401A

TM-201A/TM-401A "comp-ACT"... tough act to follow.

The word "compact" best describes the TM-201A VHF (a big 25 watts!) or the TM-401A 70-cm (12 watts) mobiles. Measures 5.6Wx1.6Hx7.2D inches (the TM-201A and TM-401A are the most compact rigs available). Ideal in size, their performances are superlative. Each features a HI/LO power switch, dual digital VFO's built-in, 5 memories plus a "COM" channel with lithium battery back-up, memory scan, programmable band scan, priority alert scan, and GaAs FET RF (front end) amplifiers. They have a highly visible yellow LED digital display, a repeater offset switch, a reverse switch, and a "beeper" to confirm operation of various switches. For superior sound quality, the separate, external speaker, can be easily mounted to project the sound in the desired direction. A 16-key autopatch UP/DOWN mic. allows easy remote operation of major front panel functions. Thanks to KENWOOD, compact radios are now available for the popular VHF and UHF bands providing high performance and superior sound quality.

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The new optional VS-1 voice synthesizer has everyone talking! A voice announces the frequency, band, VFO A or B, repeater offset, and memory channel number when these functions are selected.

Other TW-4000A optional accessories:
VS-1 voice synthesizer, TU-4C programmable two-frequency CTCSS encoder, KPS-7A fixed station power supply, SP-40 compact mobile speaker, SP-50 compact mobile speaker, MA-4000 dual-band mobile antenna with duplexor, MC-55 mobile microphone with time-out timer, and a SW-100B SWR/power meter.

More information on the TM-201A/TM-401A and TW-4000A is available from authorized dealers of Trio-Kenwood Communications 1111 West Walnut Street Compton, California 90220.

Specifications and prices are subject to change without notice or obligation.

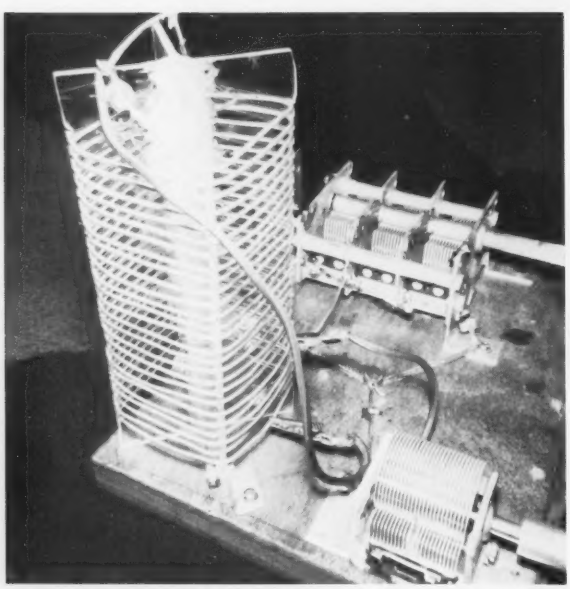
A. Lamendola KC2NT
225 Kaymar Drive
Rochester NY 14616

Top-Notch Tuner Time

Can't get your signal out of the backyard? Build KC2NT's antenna matcher and hear what you've been missing.

This tuner has been used effectively to feed the helical antenna described in the May, 1983, issue of *73*.[1] It is a developmental outgrowth of a random-wire tuner used successfully for many years with a 9.14-meter (30-foot) whip placed 15.2 meters (50 feet) above ground. The tuner has been employed with an endfed wire 19.5 meters (64 feet) long on 80 through 10 meters. It was recently used to load the house rain gutter pipe system to complete a Rochester NY/Pittsburgh PA QSO on 40 CW with 20 Watts output on my rig.

In development of this tuner, my goal has been to create a system for coupling a transmitter with 52-Ohm or 75-Ohm output to any 52- or 75-Ohm coax-fed antenna. The tuner assembly contains a couple of high-capacity condensers and a 12.7-cm-long (5-inch), 7.62-cm-diameter (3-inch) coil. However, *this circuit is not the familiar pi coupler device* as will be evident later on in this article. A noteworthy feature of the tuning unit is the greater selectivity exhibited on transmit and receive.



Antenna tuner showing the tuning-coil system and the common ground point for tuning capacitors.

Description

The general tuner configuration resembles somewhat a pi coupler output with an LC series-tuned input in place of the pi input capacitor. Filter tables describe the input system as a low-pass m-derived series half section. The output section is listed as a low-pass constant-k output half section. The fundamental tuner design is shown in Fig. 1. However, the tuner of Fig. 1 is easily simplified by replacing the series inductor as shown in Fig. 2. Note the optional capacitor bank of 3 × 500 pF. This is necessary on the 75/80-meter band with some aerials, e.g., the helical antenna. Upon close inspection of Fig. 2, one can see that the shorted portion of the coil is really two inductances in parallel with a ground return by way of the 500-pF tuning capacitor.

As the 500-pF capacitor is tapped at the various turns of the shorted inductance, the inductance of the paralleled coils changes in value. This method has proven quite effective in helping get the proper antenna-matching impedance. The 500-pF capacitor acts as a kind of band-spread device to cover small increments within the band from one end to the other. The output capacitor should require little trimming after it is set for the particular band. For some random antenna configurations, the tuner input/output connections are sometimes reversed; this seems to be especially true at the 20- through 10-meter bands.

Construction

My first tuner model used a length of B & W commercial coil, stock #3033. The unit is wound with #12 wire at 6 turns per inch. Coil length is 12.7 cm (5 inches) with a diameter of 7.62 cm (3 inches). My present tuner model has a very low cost homemade coil wound on a very simple and sturdy air-core form. Since #12 bus wire was unavailable at the local surplus outlet, I wound the coil with #14 bus wire. The coil was fitted on the form shown in Fig. 3.

Please note that this coil size should allow its use with transmitters in the 150-Watt-output class. However, when using a helically-

wound antenna with this power, a capacity hat must be installed at the antenna top. This eliminates corona discharge which will damage the aerial at the top end.

Fig. 3 shows two pieces of acrylic plastic sheet 1/8 inch thick, .3175 cm, fitted as shown. All dimensions are listed in the drawing. Epoxy cement is applied at points where the sheets come together at right angles to each other. This gives rigidity to the coil form. The winding grooves are separated 4 mm apart. The slits in both pieces should have the same width as the thickness of the plastic sheet. That will allow a secure fit for the two pieces.

In wiring the tuner, I found that a common ground point return for the capacitors was important to efficient operation. Also, it would be a definite advantage to mount the tuner components so that they may be easily interchanged and interconnected in configurations other than the one described in this article. That will allow the tuner to be configured with any and all antennas the user will ever encounter. However, my particular design has been used with random wires of varied types and has worked well.

Operation

Initial tuner settings should be determined with the aid of an antenna noise bridge. The tuner will allow close to 1:1 swr match of antenna-to-rig output of 52 or 75 Ohms. Since the device tuning is sharp, great care must be taken in using regular tuning procedure to prevent overloading and damaging the final amplifier. If an antenna bridge is unavailable, the tuner may be initially set by tuning the device for maximum signal output on the receive portion of one's transceiver. However, on transmit, a slight retuning is generally necessary. This must be done with great care, again, to avoid overloading the final.

With transceivers that have a continuously variable power-output control, e.g., Ten-Tec's Century 21, the following procedure may be used: First, adjust the rig's power output for indication of swr below 1.5:1, e.g., start at 1.2:1. Then peak tuner capacitors for 1:1 output. Increase power a bit more. If swr rises above 1:1, repeak the input capacitor and/or output capacitor. If an swr higher than 1:1 persists, either or both coil taps have to be varied. The variation of coil inductance may be as simple as sliding the clip along the turn in a plus or minus direction, or the variation may have to be as much as a turn or two plus or minus.

By way of further illustration, let us say that we wish to tune up at 7.040 kHz. We will use either a noise bridge or the alternate method just described and the helical antenna. Proper match is achieved when the tuning coil is shorted from the input end of the coil to the fourth turn from the output end. The input capacitor is connected at the seventh turn from the output end of the coil. The input capacitor is meshed in at about 65% of total capacitance. The output capacitor is meshed in at somewhat less than 50% capacitance. With these settings, the antenna bridge will indicate a deep null. This is the indication of a properly matched antenna.

In moving from one end of the band to the other, settings of the tuner are sharp. This means that retuning of the matching device is usually necessary every 5 or 10 kHz to maintain swr down to 1:1. To make sure that power is indeed at the antenna, a fluorescent lamp is put at the aerial end without touching it. If the antenna is

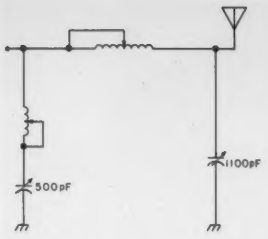


Fig. 1. Basic antenna-tuner circuit.

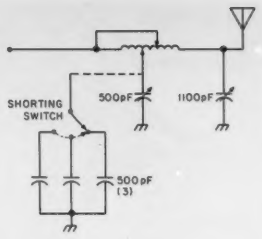


Fig. 2. Simplified antenna-tuner circuit.

loaded, the lamp will glow. Use of this aid is necessary only when determining the tuner's true settings. It is a backup check in forestalling any false indication of power transfer from rig to antenna.

Conclusion

Therefore, this tuner can match a rig to most any aerial and maintain an swr of 1:1. Because this antenna-matching device tunes sharply, additional harmonic filtering is available. The sharp-tuning feature is also evident on receiving; signals are peaked loudly and clearly. For those having capacitors in their parts box, the only other investment necessary is about 75¢ for scrap clear Lucite™ and one dollar for bus wire. When high-capacity condensers are unavailable, 365-pF capacitors with paralleled switched fixed condensers may be used.

The tuner design has been in service for many years, over 15 in all. One proof of its utility has been the longevity of the finals for my two rigs, one solid state, the other vacuum tube. The tubes are TV horizontal types. The transistors are 4-Watt types operated with a very short duty cycle at 20 to 35 Watts power output. The tuner capability in maintaining a 1:1 swr has greatly enhanced the life of the final amplifiers. ■

References

1. A. Lamendola KC2NT, "Talk Softly and Load a Big Stick," *73*, May, 1983.

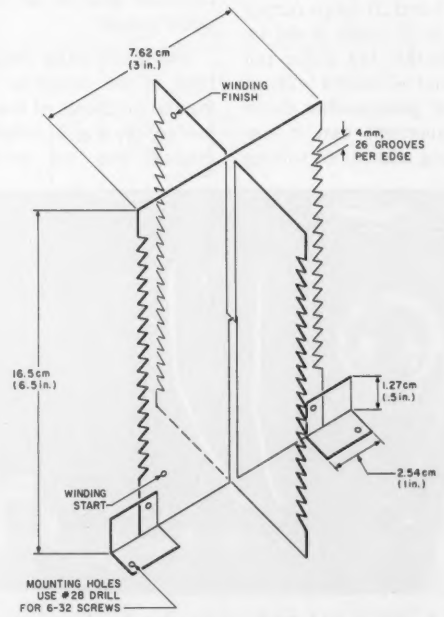

7.62 cm (3 in.)
WINDING FINISH
4 mm, 26 GROOVES PER EDGE
16.5 cm (6.5 in.)
1.27 cm (.5 in.)
2.54 cm (1 in.)
WINDING START
MOUNTING HOLES USE #28 DRILL FOR 6-32 SCREWS

Fig. 3. Clear plastic coil form.

Bob Engle K9QLL
RR 2
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Cheap Power Ploy

This rugged supply will give you more power than you ever dreamed possible. Have we gone too far this time?

Looking for a 12-volt power supply of moderate current, I found a schematic and information that promised to be just what I needed. The supply was constructed following the guidelines and recommendations; upon completion, it was checked and put into service. Then the fun began.

The supply was essentially the same as shown in Fig. 1 and was to provide between 3 and 20 Amps output (peak) at 12 volts. It did indeed do this, but it also put out about 1/2 to 3/4 volts of assorted garbage that drove the equipment that it was operating into fits of sulking and, even worse, *almost* proper operation.

While some of the equipment that is designed for use with vehicular power sources is fairly immune to power-line noise, this is not the case with most dc-operated equipment. Spikes, ripple, and assorted other garbage can cause lost memories, lousy audio, and a host of other problems. It makes no sense to attach a kilobuck piece of gear to an inadequate supply.

The supply to be described here is the result of solving the problems of the original supply (Fig. 1). While the original was not designed for ham gear, the five supplies built to this pattern (Fig. 2) have proven excellent for everything from high-power stereo gear to allband transceivers.

The supply was designed to be built using parts that are cheap and readily available. The use of surplus components dictates a certain amount of caution but can result in an excellent product at a minimum price. With a little care and some improvisation with regard to transformers, the price of this supply should be under $50.00—considerably under $50.00 if you're a bargain hunter with a sharp eye.

What about specs? This supply will provide (depending on components chosen, of course) between 15 and 30 Amps (or more) at 5 to 28 volts with ripple and noise at about 5 to 10 mV p-p and regulation usually within .05 volts or so. There is full thermal protection and the usual provisions for current limit and OVP (over-voltage protection).

First, let's take a look at the supply in Fig. 1 and see where it goes wrong. Starting with T1, which provides 18 V ac to the bridge rectifier, and then to C1, which is 70k μF, we have about 25 V dc to the pass-regulator circuit under no-load conditions. The regulator and pass transistors require a voltage at

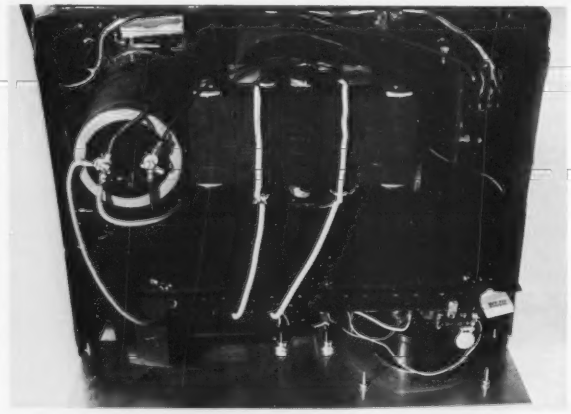


Photo A. Interior of 25-Amp supply showing position of major components and airflow shrouding.

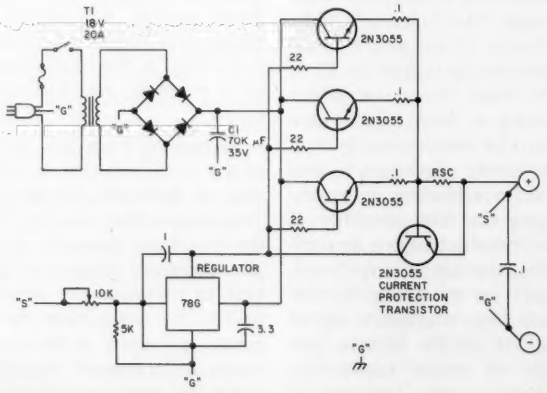


Fig. 1. Original supply.

least 5.6 higher than the output voltage to maintain regulation 13.6 V + 5.6 V = 19.2 V. If at any time the input voltage drops below 19.2 volts, the regulator loses control and the output changes.

The voltage across C1 has a waveform as shown in Fig. 3. As the current increases, the hump at the front increases. This is the principle component of the output ripple and is due to the fact that the rectifiers conduct for a short period of time to charge the capacitor. Increasing the capacitance simply increases the amplitude of this "spike," which makes the problem worse and increases the already high demands on the diodes in the bridge.

In addition, the regulator was unstable at certain currents and seemed to put out more hash than the spec sheet called for at this voltage (about 10 times more!). Bypassing and rewiring the ground circuit got rid of the hash, and increasing the input voltage improved the regulation and ripple problems. The supply proved OK for a 2-meter amp that didn't seem to care about the ripple (.2 V at 20 A), but it wouldn't serve the purpose it was originally built to serve.

At this point, I priced commercial supplies and immediately went back to the drawing board. After some research and experimentation, the supply shown in Fig. 2 was built and tested. It worked. The four supplies built to the same pattern have all worked.

The belt-and-suspenders approach has proven to be well worth the time and slight additional cost. Actually, with the price of 2N3055s at three for a buck and the use of smaller and cheaper capacitors in what is really a simple circuit, the actual cost was not much more than the original supply.

Let's now see the how and why of the "quiet" supply. The bridge rectifier uses surplus diodes rated at 100 V and 50 Amps; this seems like overkill and perhaps it is, but the peace of mind bought for $1.25 each was worth it. With C1 at 25k μF, the conduction spikes can get up to ten times the output current, so they really don't represent that much overkill after all. C1 is 25k μF at 75 volts because I got a box full for $1.00 each. R1 is simply a bleeder and should draw about 100 mA at the peak no-load voltage across C1.

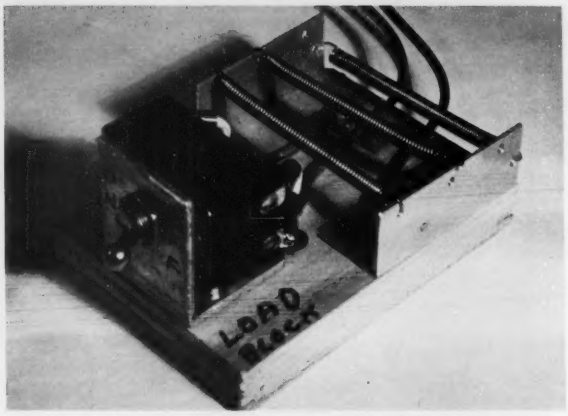


Photo B. Load resistor for testing.

T1–T4, ZD1, R2, and C5 form a circuit that thinks it is a multi-farad capacitor. The capacitance of C2 is multiplied by the beta of the Darlington circuit formed by T1–T4. The current demands on T4 are not enough to require a 3055, but they're cheap. I simply selected one with a beta of about 60 for the driver. This particular circuit is about 10 *farads* effective capacitance and the output ripple to the regulator is less than .2 volts at 20 Amps (p-p). ZD1 provides a clamp to keep the input voltage to the regulator at 24 volts in this case.

The regulator circuit is based on the 78G (or 78MG) because I like it. It is a good, flexible chip that is protected four ways from Sunday, and it is cheap.

The 78G will provide over one Amp of output, with the average beta of a 2N3055 at 40 or so. The circuit should be good for 40 Amps. Actu-

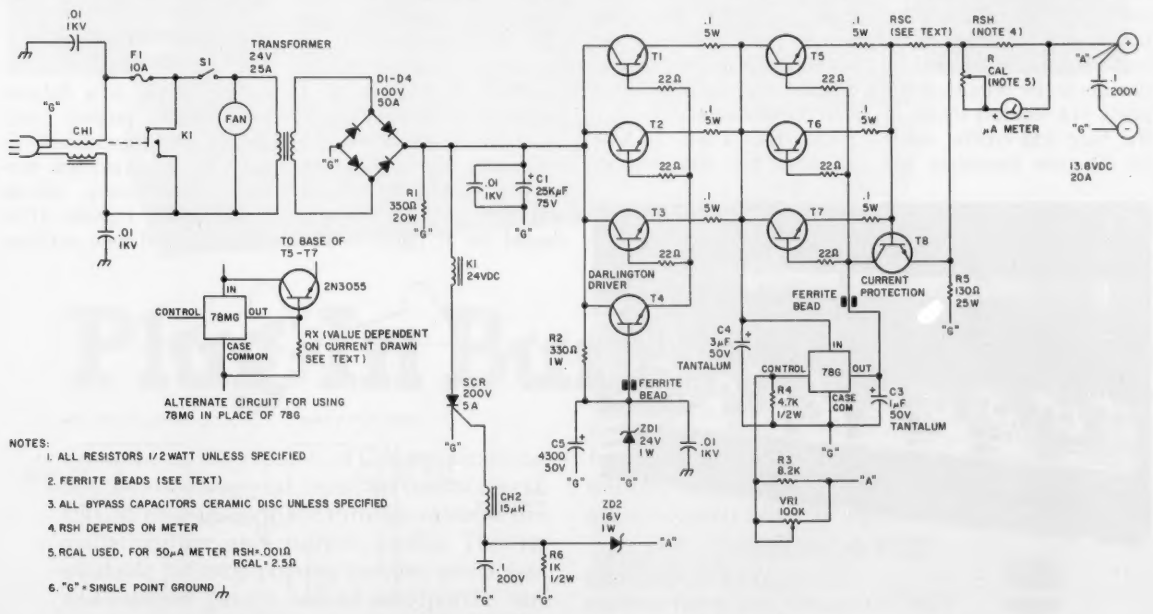


Fig. 2. Schematic (all transistors are 2N3055).

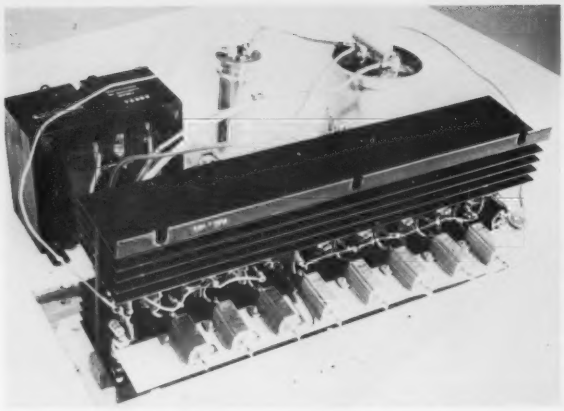


Photo C. 25-Amp supply on the breadboard.

ally, above 25 Amps or so, the use of the Darlington circuit is a good idea. When using the 78MG, the Darlington circuit *must* be used. When using the Darlington circuit, the current demands are so small that the chip may need the slight load, RX. This value will depend on the individual chip and is usually 300 Ohms to 1k Ohms for a 13.5-V supply.

R3, R4, and VR1 set the output voltage. R3 is used to set the maximum voltage and VR1 trims this to the desired lower output voltage. With R3 at 8.2k and VR1 at 100k, this will be about 14 V maximum. The connection point for R3 should be at the output connector or, if remote sensing is needed, it can go to the remote sense point. The resistors shown in the base and emitter leads of the pass transistors are absolutely necessary. They prevent one transistor from hogging all the current. The base resistors are not particularly critical as to value, and 10 to 22 Ohms will do fine (all the same value, of course). The emitter resistors should be about .1 Ohms and 5 to 10 Watts, depending on supply voltage, current, and the number of pass transistors.

The number of pass transistors required will depend on several factors, the most important being the desired output current of the supply.

The 2N3055 is rated at 15 Amps and 117 Watts (TO-3 case) at 25° C. Expecting one to provide both at the same time is an invitation to disaster, especially with surplus components.

Let's take a realistic look at what the requirements will be for this supply providing 13.6 volts at the 20-Amp level. The regulator will need approximately 6 volts to work properly, so under a 20-Amp load it will have to dissipate about 120 Watts. The capacitor multiplier at 20 Amps will need about 5 or 6 volts, so we now have 240 Watts at full current. This has to be dissipated as heat via the heat sink and is one good reason for derating the transistors. Derating surplus transistors to 8 Amps (or preferably less) and 50 or 60 Watts will make for a longer life and lessen the chance of catastrophic failure.

The output resistor, R5, provides a constant minimum load for the supply and helps with stability (100 mA or so will be adequate—130 Ohms for the 13.6-volt supply).

If you look at the circuit and remember your solid-state basics, it can easily be seen that we have an amplifier with quite a bit of gain. Certain steps must be taken to ensure stable operation and to prevent amplification of unwanted signals. As Elmer used to tell me, "Build it like you mean it." In this case it means bypassing everything, especially the 78G. All those G points on the schematic mean that all grounds are brought to a single point on the chassis. More about this during the mechanics discussion. The ac line should be filtered and bypassed, and the case should be rf tight, in this case to keep it out rather than in. Ferrite beads on the base leads of the Darlington driver(s) are not a frill if powering VHF equipment is contemplated.

The heat sink used is one that seems to be common on the surplus market. The ones that I bought came with four TO-3 transistors and miscellaneous parts and cost about $3.00 each. The heat sink is 12" × 4" × 2.5" with 10 fins for a total radiating area of 600 square inches. All of the hot parts are mounted on the heat sink using aluminum stock, as shown in the photos. The bridge can be mounted on its own sink or on an extension bolted to the pass sink. A muffin fan (105 cubic feet per minute) provides cooling, with cardboard shrouding to direct the air flow through the heat sink. The 78G is mounted on the end of the heat sink farthest from the fan at the hottest point. If thermal limits are exceeded, it shuts down the pass transistors. Many home-built supplies fail to take advantage of this feature which is built into most regulator chips. This is an oversight that can prove costly.

Construction/Mechanics/ Testing Options

This supply is a definite breadboard project and should be approached as such (by the way, sink cutouts make fancy, cheap breadboards). I prefer TO-3 devices, used with sockets.

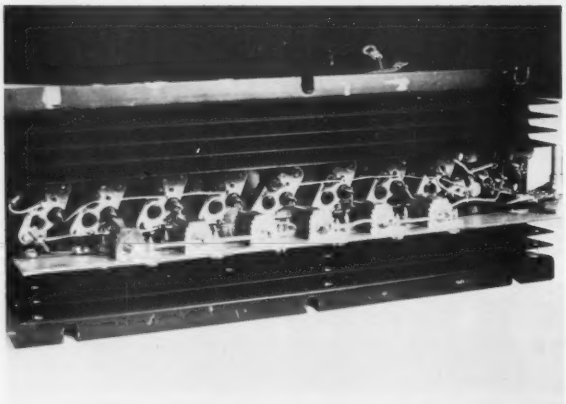


Photo D. Heat-sink assembly for 20-Amp supply.

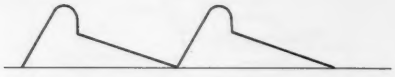


Fig. 3.

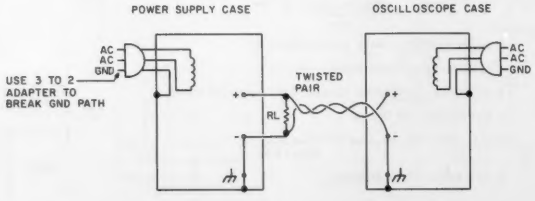
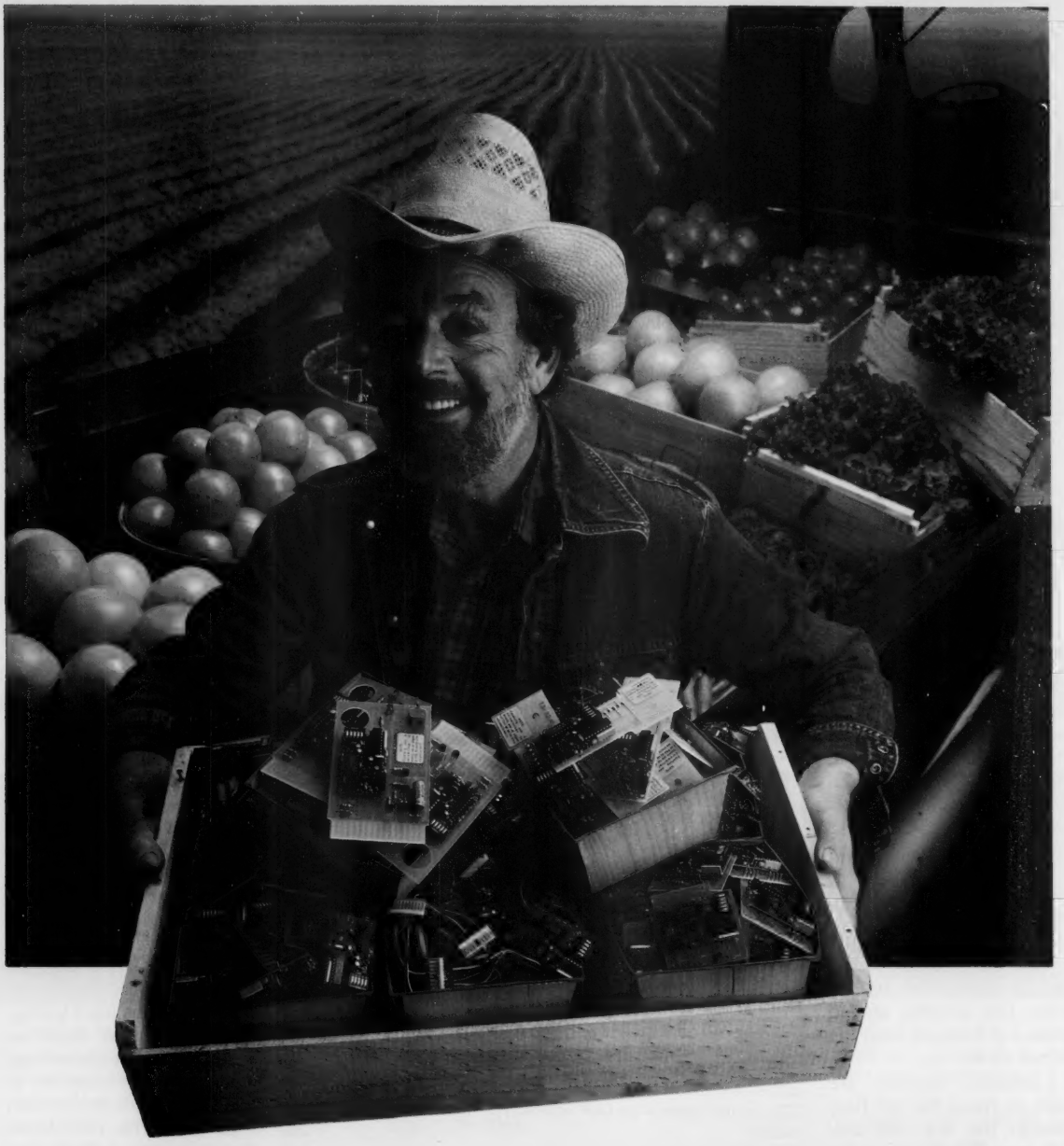


Fig. 4.



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Whatever package style you use, special care should be taken in mounting. All burrs should be removed and the best-possible contact between the device and the heat sink must be ensured. This means using heat-conducting compound on all devices. As you install each device, verify that there are no shorts to the heat sink. The precision emitter resistors that I used were hamfest specials, but the ceramic ones available at most parts houses will serve as well. Use #10 or #12 wire for the collector and emitter buses. I simply stripped out some scraps of Romex left over from rewiring the shack. The main run wiring used was #10 or #8 THHN wire scrounged from an electrical contractor's scrap box.

The heat sink is at ground potential but is insulated from the case. Grounding is accomplished by running a single wire from the common connection of the 78G (the 78G is *not* insulated from the sink) to the ground common point. *All* ground connections are brought to the common point, using heavy wire that is as short as possible. The lines from the capacitors, the rectifier, the negative output post, and the ac-line ground conductor are connected to this point. This prevents ground loops and helps to keep the output clean.

Cardboard shrouds are used to focus the air flow through the sink and provide for efficient use of the cooling air. The case should be well ventilated. Transmitter techniques can be used for rf proofing. All of the usual transformer tricks can be used for your supply: buck/boost, series, parallel, etc. I do have a couple of suggestions that might prove handy.

First, there are available surplus small transformers that provide 2 volts or so at up to 30 Amps (Fair Radio is one source). These are great when the "main" transformer is just a bit low.

Second, an often-overlooked source for high-current transformers is gas stations. Really! Those old Tungar bulb chargers had some bodacious transformers in them with multi-tap primaries and secondaries. Many times they can be had for hauling them off. (Take help!) Newer ones also are available after the selenium bridges have blown. Those with aluminum secondaries will need some of the special grease for making good connections to aluminum wire. If you're using the supply to power an SSB rig or for other low-duty-cycle applications, you can push the transformer current ratings a bit, but it is best to have a bit of reserve for good dynamic performance.

Protection circuitry is an absolute must for this supply if used with voltage-sensitive equipment. Any of the popular OVP circuits may be used; the one used here crowbars the ac line using a simple circuit that costs less than a single high-current thyristor.

Current limiting is nice also; the circuit used here is a common one and performs quite well. Rsc is set for a .7-volt drop at the desired current level. At this point the voltage will drop to hold the output current at this level. Rsc can be built up by paralleling standard values. Rsc should be in the airstream to keep it cool. The choke and capacitor on the gate of the SCR keep garbage on the line from causing false firing. Switching high-current loads can cause this type of transient. (I blew a few fuses before I figured that one out.)

This supply should be breadboarded and tested before final construction. This is not a complicated process, and it will pay dividends when the supply is put to use. As with any homebrew project, you are spending time rather than money. This is time well spent.

The first step is to assemble the heat sink with all its components. Then a simple test to determine the necessary I/O differential voltage is needed. With a sensitive DVM and a light load on the output, vary the input voltage until the output drops an mV or so. This is the voltage which must be supplied to the pass circuit to maintain regulation. You now know the necessary voltage that the transformer must supply under full load for proper operation.

To test the supply under load, you will need a load resistor (see photo). One is made by paralleling several short pieces of nichrome heating coil. (I got 10 feet for $3.00 at the local electrical-supply house.) By adding more pieces in parallel, the current increases. If you didn't build an ammeter into the supply, a 7-7/16" length

Parts List

Note: This supply was designed to take advantage of surplus parts. Therefore, the prices listed will be dependent on the source and availability of each item.

All bypass capacitors are ceramic disc unless otherwise specified.
All resistors are ½ Watt unless otherwise specified.

Bypass—.01, 1-kV disc, 4 @ .25 ea.	$1.00
Bypass—.1, 200-V disc, 2 @ .25 ea.	.50
K1—relay, 24-V-dc coil, 3PDT, all contacts in parallel	1.50
Fan—105 cfm muffin-type fan	7.50
Xfmr—any combination of transformers supplying the necessary voltage and current may be used. The surplus xfmr used in Fig. 2 was 24 volts @ 25 Amps.	18.00
D1-D4—100 V @ 50 A used in this supply, 4 @ $1.25 ea.	5.00
C1—25,000 μF @ 75 V	1.00
Cs—4300 μF @ 50 V	.39
C3—1 μF @ 50 V tantalum capacitor	.39
C4—3 μF @ 50 V tantalum capacitor	.39
Resistors:	
R1—350 Ohms, 20 W	.39
RC5—130 Ohms, 25 W	.39
R2—330 Ohms, 1 W	.15
R3—8200 Ohms, ½ W	.05
R4—4700 Ohms, ½ W	.05
R6—1000 Ohms, ½ W	.05
Base resistors—22 Ohms, ½ Watt, 6 @ .05 ea.	.30
Emitter resistors—.1 Ohms, 5 Watts, 6 @ .35 ea.	2.10
VR1—100k-Ohm trimpot	.49
Rsc—current limit, see text	
Rsh and Rcal depend on meter used. For 50-uA meter used in Fig. 2, Rsh was .001 Ohms, and Rcal 2.5k-Ohm trimpot.	
Transistors—2N3055, 8 @ .33 ea.	2.64
SCR—200 V @ 5 Amps used here	.29
ZD1—24-V, 1-Watt zener diode	.24
ZD2—value depends on OVP desired. (16 V used for 13.8-V supply)	2.64
78G—Voltage regulator	2.95
CH1—14 bifilar turns #14 wire on ferrite rod approx. ½" diameter, 4½" length	2.00
CH2—surplus 15-mH choke	.25
S1—15-Amps @ 120 V toggle switch	1.49
F1—10-Amp fuse in clip-type holder.	1.25
Heat sink—surplus 2½" × 4" × 12"	4.50
Meter—50 uA used in Fig. 2 supply, surplus	3.00

Misc. case, hardware, aluminum stock, suitable wire (see text). The case shown in the photos is 5" × 12" × 15" and was purchased at a hamfest for $1.00.

Substitution: Since this project is designed to use surplus components, reasonable substitutions are to be expected. When surplus components are used, derating should be the rule. C3 and C4 must be tantalum capacitors for proper operation. The resistors used at R1 and R5 should be capable of dissipating at least twice the I × E power for safety and stability.

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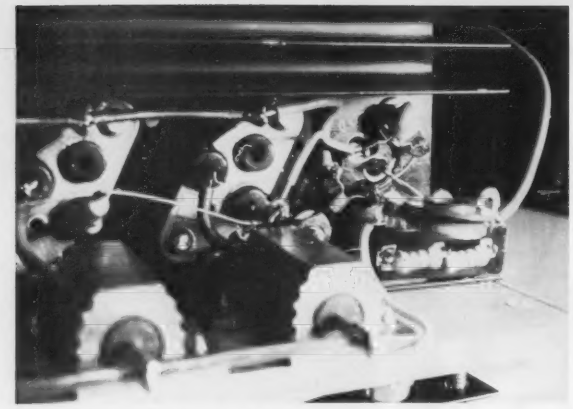

Photo E. Detailed view of 78G wiring (note short leads on bypass).

of #12 wire will serve as a shunt, providing 1 mV per Amp. Using the setup shown in Fig. 4, look at the output under load. The setup prevents ac ground loops from showing up as false noise on the scope. If the scope is not more sensitive than .01 V per cm, the trace should barely widen under full load. Check at several output levels. If you have inordinate noise, make sure the setup is right before troubleshooting. At the current-limit level, using the circuit shown, there will be a large increase in ripple—this is normal. If Rsc needs to be lowered, it can be paralleled with additional resistors.

If the output behaves up to a certain current level and then falls off, more input voltage may be necessary. When testing the supply on the breadboard without the fan, the heat sink gets hot quickly—caution! If it gets too hot, the 78G will shut down until things cool off. If you have high-frequency hash, it may be necessary to add .01 discs to the input and output of the 78G. In stubborn cases, you may have to change the layout around the 78G. If the supply is unstable at some current levels and stable at others (higher), you may have a ground-loop problem. Try changing the lengths of ground leads and if you're using the Darlington circuit for the regulator pass, try decreasing the value of RX.

One of the supplies that I constructed is variable from 5 to 20 volts (VR1 on the front panel and a switch to use all or part of the secondary) at 20 Amps. It has proven to be one of the most often used bench tools I have. Another smaller (12 V at 15 A) supply provides the dc for a TV-studio installation. This supply is, of course, a compromise; you pay back in lack of efficiency for a clean stable output. "Build it like you mean it," and it should provide you with a long trouble-free performance—quietly. ■

References

Application Note 90, "Performance Measurements," *Hewlett Packard, 1968 DC Power Supplies Catalog and Handbook*, p. 72–73.

73, "Exorcising Power Supply Demons: What to do When Murphy Visits," March, 1978, p. 52–55.

73, "A New Breed of Voltage Regulators: Throw Away Your Old 309s," March, 1977, p. 62–64.

73, "Four Terminals Are Better Than Three: Using the New Voltage Regulators," November, 1978, p. 226–227.

73, "Power Plus!—A 20-Amp Adjustable, Regulated Supply," March, 1979, p. 42–44.

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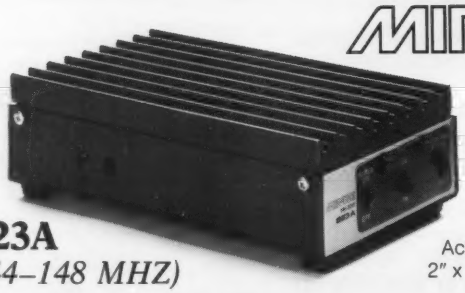

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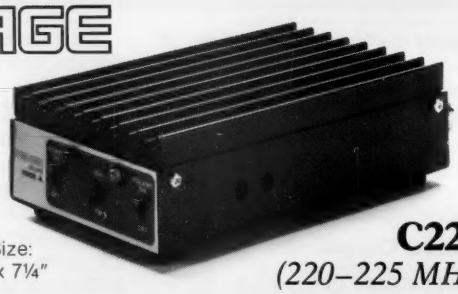

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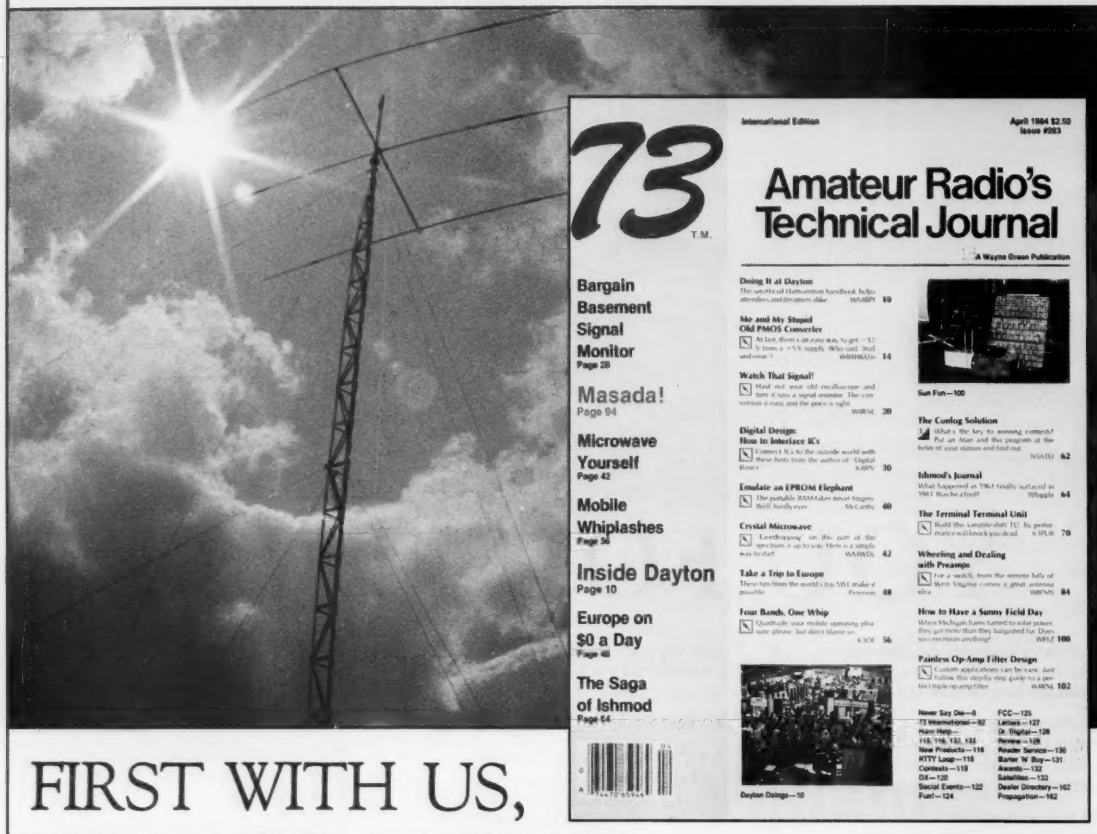

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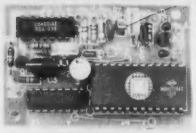

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```
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- Selects options menu.

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OPTIONS MENU SCREEN

```
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 S. SELCALL          ????
 T. ARQ TIMEOUT        30
 U. USOS               ON
 M. MORSE FILL (BT)   OFF
 R. RTTY SYNC (NUL)   OFF
 A. AUDIO FEEDBACK    OFF
 C. AUTO CR            ON
 L. AUTO LF            ON
 B. BEACON RECORD     OFF
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```
                    hh:mm:ss

 L. LOAD
 E. EDIT
 M. MOVE
 S. SAVE
 X. SET XMT BUFFER SIZE
 C. SET COLOR
 T. SET TIME
```

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If you've ever repaired or tested an SSB transmitter, then you've used or needed a two-tone test oscillator. A dependable source of high-quality sine waves, the oscillator can be used for any number of transmitter tests. Typical applications include checking circuit gains, peaking tuned stages, adjusting phasing exciters, checking or setting ALC thresholds, and measuring amplifier linearity.

Unfortunately, many of the published two-tone circuits are of limited use because the output waveform is not pure enough for some tests. A good linear amplifier, for example, will have odd-order intermodulation products 35 to 40 dB down from the desired output. Obviously, the two tones used to measure such performance should be at least that good when they go in the microphone jack. Minus 40 dB is only 1% distortion though, and many testers are incapable of generating waveforms that pure.

The published circuits which do provide sufficient audio purity often attain it through the use of sharp audio filters. Those filters require either high-quality components or several circuit trims to keep them on the right frequency. Precision parts work fine but are difficult to find and expensive to buy. Lower-quality components need to be selected or trimmed and even then may drift enough to require frequent readjustment.

The oscillator described here has a number of features making it a better choice for the amateur test bench:

- All distortion products are at least 60 dB (typically 65 to 70 dB) below the primary output. That's good enough for taking even a hard look at state-of-the-art equipment.
- The unit can be duplicated using everyday parts (5% resistors and 20% capacitors) because purity has been achieved by careful oscillator design and not heavy filtering.
- Unlike most commercial equipment, this unit is physically small, rugged, and well shielded. When you need it, it works; when you don't, it isn't in the way.
- The box plugs right into the transmitter microphone jack and includes a handy

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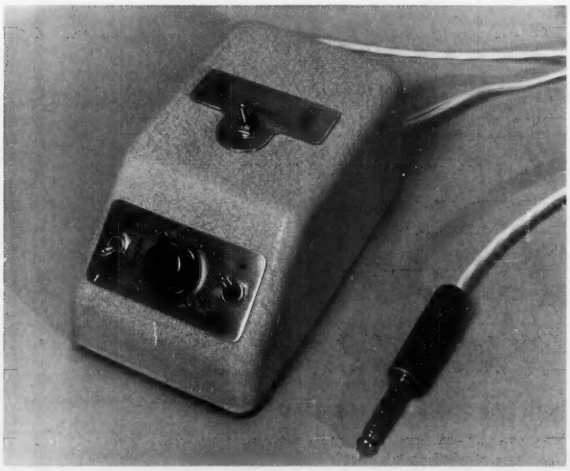


Small enough to be out of the way, this neat unit is big on quality and convenience.

switch for keying the transmitter. The adjustable (1 vrms maximum) audio output is sufficient for driving rigs having either high or low impedance inputs.

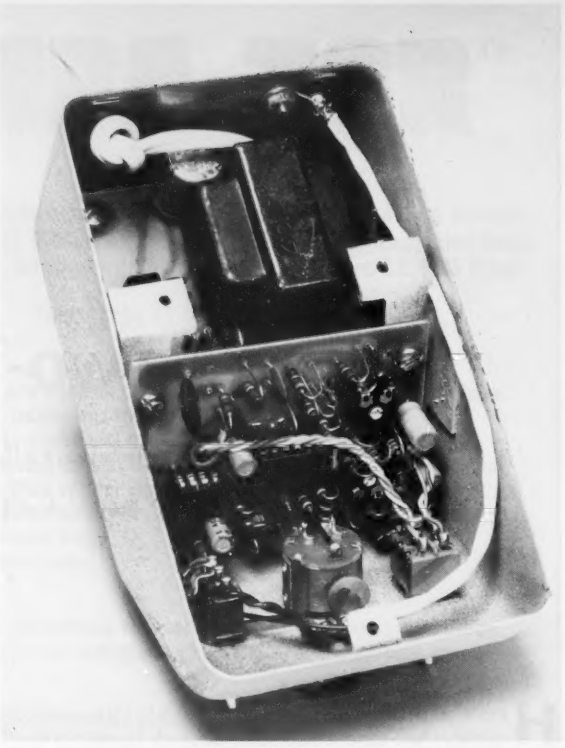
● Power drain is only 12 mA at 9 volts, so you can run the unit from a single 9-volt battery and not worry about limited battery life.

The Circuit

The two oscillators are designed around an LM324 quad op amp as shown in Fig. 1. Each oscillator is followed by a simple peaked low-pass filter and the two signals are combined in the 741 output amplifier. Switching is provided for selecting either or both tones and the output level is adjustable over two ranges covering 0 to .18 and 0 to 1 volt rms.

The identical oscillators are carefully considered versions of the classic Wien Bridge oscillator circuit (see the sidebar, "On the Trail of the Wien Bridge," elsewhere in this article). The sine waves produced by these oscillators have only about 0.5% distortion. The frequency of oscillation is determined by four components: the series capacitor and resistor between the op amp's output and its non-inverting input terminal, and the parallel capacitor and resistor between there and ground. The oscillation frequencies with the components specified in Fig. 1 are 500 and 1750 Hz (not the 440 and 1600 Hz labeled on the photographed unit).

The remaining components in the oscillator circuit provide dc biasing and set the loop gain to unity. The trim resistor is used to adjust the small signal gain a little higher than required to sustain oscillation, and then the diodes and 470k resistor in the feedback path reduce the gain by 10% when the output signal grows larger than about 1 volt peak to peak. Overall



The 9-volt power supply takes up most of the room inside. Current drain is only 12.5 mA, so battery operation is an attractive space- and money-saving option.

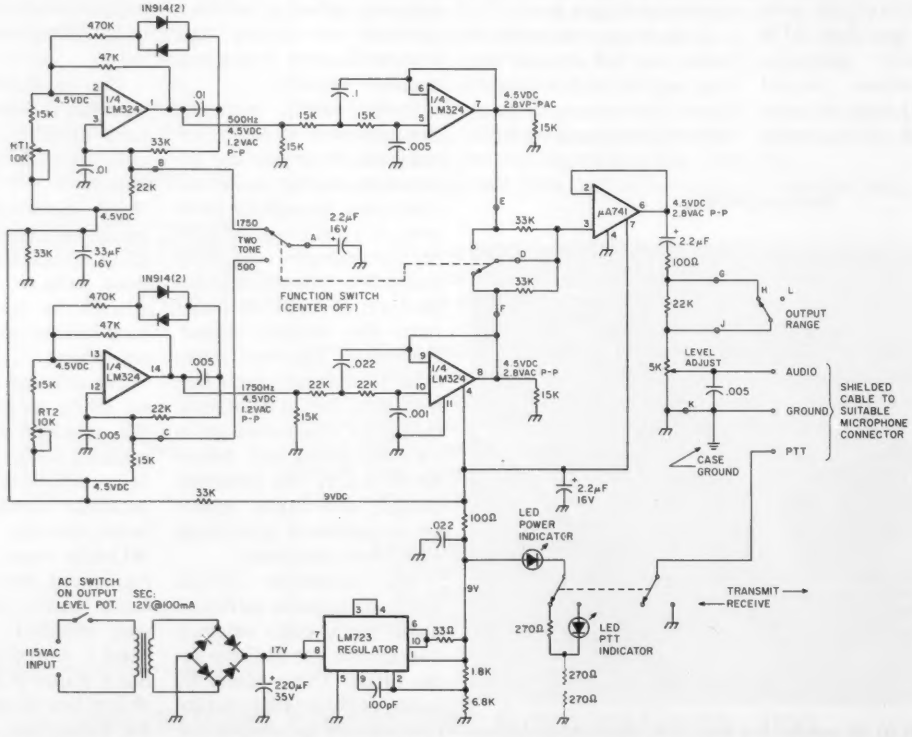
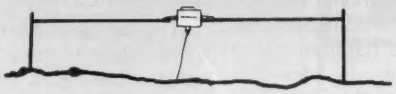
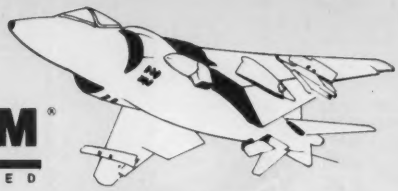


Fig. 1. Two-tone oscillator schematic. Resistors are ¼ W, 5%. Letters shown where wires leave PC board (see Fig. 3).





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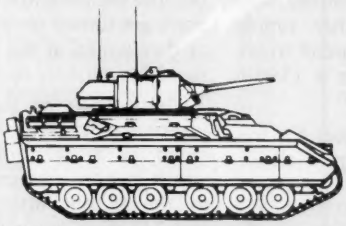

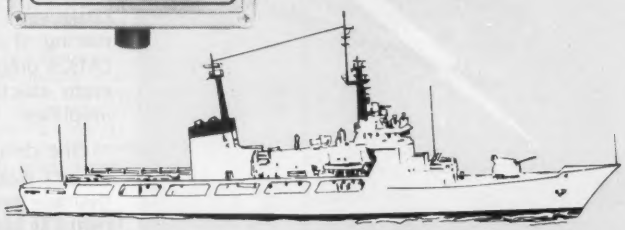

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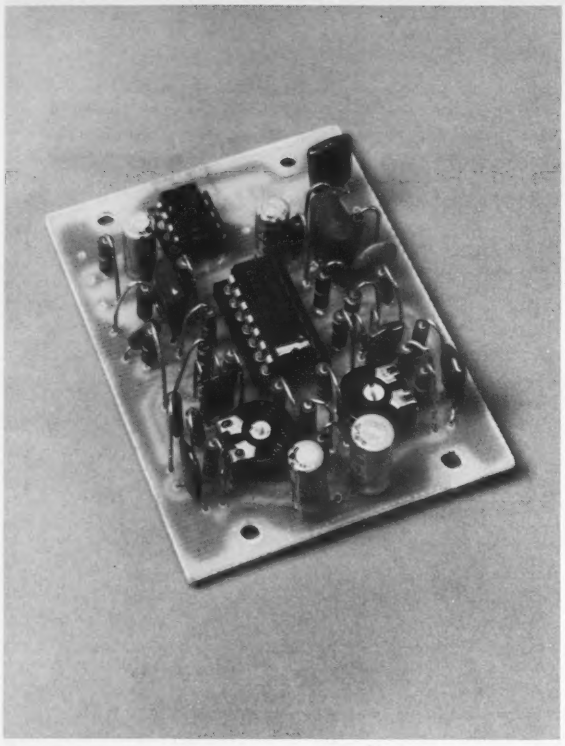

Standing components on end lets everything fit on the 2" by 2.7" PC board. More real estate might be necessary if you build with perf or prototyping board.

distortion is low because even this relatively minor gain reduction is applied gently as the diodes turn on.

The distortion introduced by this type of gain control is mostly at the third harmonic of the oscillation frequency. An additional 5-dB reduction of that component is realized by driving the diodes and 470k resistor from a point after the feedback capacitor instead of directly from the amplifier output as is usually the case. Even with this change, the third harmonic signal is still some 10 dB higher than the second harmonic. In a sense, this is desirable because the third-harmonic energy, being farther from the fundamental frequency, is easier to filter off.

The oscillator outputs are dc-biased to half the supply voltage by a simple resistive voltage divider. That step maximizes the output ac level possible before the amplifiers saturate. Each section of the quad amplifier is also dc-loaded with a 15k resistor. The load resistor prevents crossover distortion by forcing the rather simple LM324 output circuit to operate strictly as a class-A amplifier.

One design goal for this project was to have all undesired frequency components at least 60 dB below the primary outputs. To achieve this, the oscillators are followed by low-pass active filters. Since the oscillator outputs are so clean, this goal can be reached with only a small amount of filtering. That's significant because it means the filter stages don't have to be held to tight frequency tolerance and so won't require precision parts. The filters have a gain of one at dc and a peak ac gain of 2.25.

The dc gain causes the filter output to copy the oscillator biasing at half the supply voltage. The ac gain ensures that with overdrive the filter output will begin clipping before the oscillator output does. If the oscillator could somehow saturate first, it might be possible for the misadjustment to go unnoticed because the filter would tend to hide the evidence. Another benefit of having gain in the filter stage is that the oscillator output level can be lowered. That reduces distortion because the feedback diodes don't get turned on as fully as they would at the higher signal level.

The outputs of the two low-pass filters are combined in a 741 amplifier which in turn is ac-coupled to the output attenuator. The 741 does not need the 15k load resistor because its sophisticated output circuit doesn't have the distortion problems of the simpler LM324.

After passing through the output-level control, the audio leaves the box in a shielded cable it shares with the push-to-talk line. The microphone plug on the end of this short cable should match the transmit-

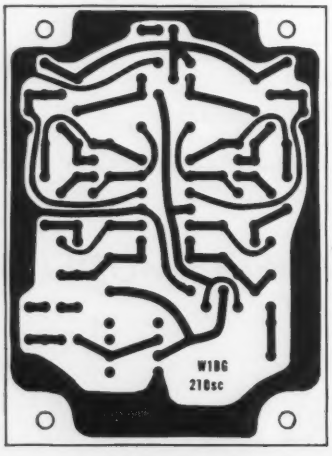

Fig. 2. PC pattern of audio circuits from the copper side of the board. This pattern can be used as an etching/drilling guide as explained in the text.

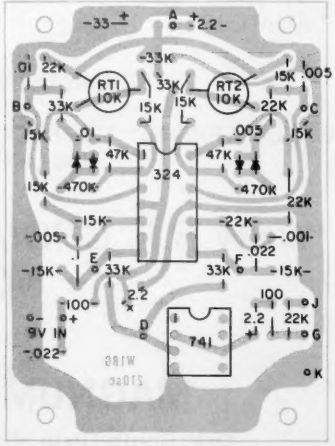

Fig. 3. Component placement (from the top side of the board).

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*EX-243 Electronic keyer unit	50.00	
*FL-45 500 Hz CW filter (1st IF)	59.50	
*FL-54 270 Hz CW filter (1st IF)	47.50	
*FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
*FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
*FL-44A SSB filter (2nd IF)	159.00	144.95
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-12 Mobile mount	19.50	
*Options also for IC-745 listed below		
IC-730 8-band 200w PEP xcvr w/mic	$829.00	599.95
FL-30 SSB filter (passband tuning)	59.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
FL-45 500 Hz CW filter	59.50	
EX-195 Marker unit	39.00	
EX-202 LDA interface; 730/2KL/AH-1	27.50	
EX-203 150 Hz CW audio filter	39.00	
EX-205 Transverter switching unit	29.00	
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-5 Mobile mount	19.50	
IC-720A 9-band xcvr/.1-30 MHz rcvr	$1349.00	899.95
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 kHz AM filter	49.50	
SM-5 8-pin electret desk microphone	39.00	
MB-5 Mobile mount	19.50	

IC-745 9-band xcvr w/.1-30 Mhz rcvr	$999.00	769.95
PS-35 Internal power supply	160.00	144.95
CFJ-455K5 2.8 kHz wide SSB filter	4.00	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	

*See IC-740 list above for other options (*)

Options: 720/730/740/745	Regular	SALE
PS-15 20A external power supply	$149.00	134.95
EX-144 Adaptor for CF-1/PS-15	6.50	
CC-1 Adapt. cable; HF radio/PS-20	10.00	
CF-1 Cooling fan for PS-20	45.00	
EX-310 Voice synth; 745, 751, R-70A	39.95	
SP-3 External base station speaker	49.50	
Speaker/Phone patch - specify radio	139.00	129.95
BC-10A Memory back-up	8.50	
EX-2 Relay box with marker	34.00	
AT-100 100w 8-band automatic ant tuner	349.00	314.95
AT-500 500w 9-band automatic ant tuner	449.00	399.95
MT-100 Manual antenna tuner	249.00	224.95
AH-1 5-band mobile antenna w/tuner	289.00	259.95
PS-30 Systems p/s w/cord, 6-pin plug	259.95	233.95

ICOM

Options - continued	Regular	SALE
CF-1 Cooling fan for PS-15	45.00	
PS-20 20A switching ps w/speaker	229.00	199.95
GC-4 World clock	99.95	94.95
HF linear amplifier	Regular	SALE
IC-2KL w/ps 160-15m solid state amp	1795.00	1299
VHF/UHF base multi-modes	Regular	SALE
IC-251A* 2m FM/SSB/CW transceiver	$749.00	549.95

***$50 Factory Rebate - until gone!**

IC-551D 80 Watt 6m transceiver	$699.00	599.95
PS-20 20A switching ps w/speaker	229.00	199.95
EX-106 FM option	125.00	112.95
BC-10A Memory back-up	8.50	
SM-2 Electret desk microphone	39.00	
IC-271H 100w 2m FM/SSB/CW xcvr	899.00	799.95
IC-471H 75w 430-450 SSB/CW/FM xcvr	1099.00	Call
PS-35 Internal power supply	160.00	144.95
PS-15 20A power supply	149.00	134.95
IC-271A 25w 2m FM/SSB/CW xcvr	699.00	619.95
AG-20/EX-338 2m preamplifier	56.95	
IC-471A 25w 430-450 SSB/CW/FM xcvr	799.00	699.95
PS-25 Internal power supply	99.00	89.95
EX-310 Voice synthesizer	39.95	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	
VHF/UHF mobile multi-modes		
IC-290H 25w 2m SSB/FM xcvr, TTP mic	549.00	489.95
IC-490A 10w 430-440 SSB/FM/CW xcvr	649.00	579.95
VHF/UHF/1.2 GHz FM	Regular	SALE
IC-22U 10w 2m FM non-digital xcvr	299.00	249.95
EX-199 Remote frequency selector	35.00	

ICOM 2m Closeout

Closeout item	Regular	NOW
IC-25A 25w, 2m, grn leds, up-dn TTP mic	359.00	269.95
BU-1 Memory back-up	38.50	†10.00
IC-25H as above, but 45 watts	389.00	299.95
BU-1H Memory back-up	38.50	†10.00

†BU-1/H $10 purchased w/IC-25A/H, otherwise $38.50

IC-27A Compact 25w 2m FM w/TTP mic	369.00	329.95
IC-27H Compact 45w 2m FM w/TTP mic	409.00	369.95
RP-3010 10w 440 Mhz FM repeater	999.00	899.95
IC-37A Compact 25w 220 FM, TTP mic	449.00	399.95
IC-47A Compact 25w 440 FM, TTP mic	469.00	419.95
UT-16/EX-388 Voice synthesizer	29.95	
IC-120 1w 1.2 GHz FM transceiver	499.00	449.95
RP-1210 10w 1.2 GHz FM repeater	1199.00	1089
Cabinet for RP-1210 or RP-3010	249.00	
Duplexer 1210 10w 1.2 GHz duplexer	1199.00	1089
6m portable	Regular	SALE
IC-505 3/10w 6m port. SSB/CW xcvr	$449.00	399.95
BP-10 Internal Nicad battery pack	79.50	
BP-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	

Hand-held Transceivers		
Deluxe models	Regular	SALE
IC-02A for 2 meters	$ 319.00	289.95
IC-02AT w/DTMF	349.00	314.95
IC-04A for 440 MHz	TBA	
IC-04AT w/DTMF	379.00	339.95
Standard models	Regular	SALE
IC-2A for 2 meters	$ 239.50	214.95
IC-2AT with TTP	269.50	219.95
IC-3A for 220 MHz	269.95	234.95
IC-3AT with TTP	299.95	239.95
IC-4A for 440 MHz	269.95	234.95
IC-4AT with TTP	299.95	239.95

Accessories for Deluxe models	Regular
BP-7 800mah/13.2V Nicad Pak - use BC-35	67.50
BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50
BC-35 Drop in desk charger - all batteries	69.00
BC-16A Wall charger - BP7/BP8	10.00
Accessories for both models	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	39.50
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	29.50
BP-4 Alkaline battery case	12.50
BP-5 425mah/10.8V Nicad Pak - use BC35	49.50
CP-1 Cig. lighter plug/cord - BP3 or DIx	9.50
DC-1 DC operation pak for standard models	17.50
LC-2AT Leather case for standard models	34.95
LC-14 Soft case for Deluxe models	17.95
HM-9 Speaker microphone	34.50
HS10 Boom microphone/headset	19.50
HS-10SA Vox unit for HS-10 (dlx only)	19.50
HS-10SB PTT unit for HS-10	19.50
ML-1 2m 2.3w in/10w out amplifier	SALE 79.95
ML-25 2m 2.3w in 20w out amplifier	SALE 179.95
3A-TTN Optional TT Pad - 2A/3A/4A	39.50
SS-32M Commspec 32-tone encoder	29.95

Shortwave receivers	Regular	SALE
R-71A 100 Khz-30 Mhz digital receiver	$799.00	689.95
FL-32 500 Hz CW filter	59.50	
EX-310 Voice synthesizer	39.95	
RC-11 Wireless remote controller	59.95	
CR-64 High stability oscillator xtal	56.00	
R-70 100 Khz-30 Mhz digital receiver	749.00	599.95
EX-257 FM unit	38.00	
IC-7072 Transceive interface, 720A	112.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
FL-63 250 Hz CW filter (1st IF)	48.50	
SP-3 External speaker	49.50	
CK-70 (EX-299) 12v DC option	9.95	
MB-12 Mobile mount	19.50	

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ON THE TRAIL OF THE WIEN BRIDGE
Selecting a Good Oscillator

There's certainly no shortage of published audio-oscillator circuits, but finding the right one for this two-tone tester wasn't easy. The requirements (low distortion, simplicity, low power consumption, and reliability) seem common enough, but the circuits usually recommended for the task all had flaws rarely mentioned in the literature. Mostly those flaws involved the means chosen to control the oscillator gain.

An oscillator is really an amplifier around which has been placed some frequency-sensitive positive feedback. The combination of amplifier gain and feedback attenuation is called *loop gain*, and at the frequency of oscillation, the loop gain is *exactly* one and has *exactly* zero phase shift. That's another way of saying that the signal presented to the input of the amplifier is precisely the one needed to produce an output which will come back through the feedback network to reproduce itself. The phase shift across the feedback circuit is frequency-sensitive, so any departure from zero loop phase can be corrected by a change in the oscillation frequency. Unfortunately, any departure from the desired amplifier gain is a little harder to accommodate.

Since real-world components are imperfect, we can't simply specify parts that give the magical gain of one, but we can design in circuit features which will automatically adjust the gain for us. The easiest thing to employ is the most widely used: saturation. Saturation, or peak clipping, is what happens when an amplifier is asked to produce more output than it possibly can. Gain is defined as the ratio of output to input, and as saturation occurs, the effective gain must drop since the output amplitude remains nearly constant while the input drive increases. Saturation clearly introduces distortion and most simple sine-wave oscillators have distortion in the 5-to-15% range because they depend on saturation effects to maintain the loop gain at unity.

Modern laboratory oscillators usually achieve low distortion by using sophisticated agc circuits to regulate gain. Early equipment did the same thing by the clever use of a nonlinear component: the tungsten filament of a common panel lamp. The resistance of the bulb filament goes up as the average current through the lamp increases, and very good gain control can be had by the proper application of that effect. The classic lamp-stabilized Wien Bridge oscillator is a very elegant circuit capable of producing extremely pure sine waves. It was devised in the 1930s, in part by a young engineer named William Hewlett who later formed a company with his friend David Packard to manufacture the oscillator.

The modern version of that circuit, shown in Fig. A, is reproduced in almost every text discussing audio oscillators. The light bulb is driven with a signal proportional to the oscillator's output. The filament resistance averages that output over several tenths of a second and so controls the oscillator gain to exactly one. Oscillator distortion may be as low as .01%.

Unfortunately, the thermal properties of the lamp filament introduce a tendency for the output amplitude to ring at a frequency near 10 Hz. This secondary oscillation can be started by the slightest circuit disturbance and may take 10 or 15 seconds to decay away. The commonly available lamps used in this circuit also require more drive voltage than a 9-volt battery provides. Moreover, the circuit needs 15 to 20 mA of supply current per oscillator and that seems excessive for a battery-powered unit which doesn't really have to deliver any output power. Together, these several considerations make the circuit of Fig. A undesirable for this project despite its excellent output waveform.

The next commonly recommended circuit, shown in Fig. B, is usually offered as a modern replacement for the classic arrangement because it uses a JFET as the variable resistor instead of a light bulb. Unfortunately, a JFET does not make a good resistor since its resistance varies with the drain-to-source voltage as well as the gate-to-source bias. That means the resistance will be changing during each oscillation cycle, and the changing gain that causes leads to problems. Distortion was a terrible 5 to 10% with the several circuits I tried. The variations published most often were the poorest performers because the zener diodes in the output-level detector *guaranteed* the FET would be operated outside its linear range!

The circuit type finally selected is shown in Fig. C. Diodes are used in the feedback path to switch in a resistor and lower the gain as the output amplitude increases. This scheme will introduce some distortion because the amplifier gain is changing during every oscillation cycle. Only a slight gain change is needed, however, and the overall distortion at the oscillator output can be kept well below 1%. The final circuit design was optimized for the IC used and generates a sine wave having only 0.5% distortion. As a bonus, the unwanted energy is primarily in the third harmonic where it is relatively easy to filter out.

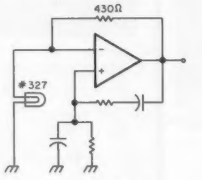

Fig. A.

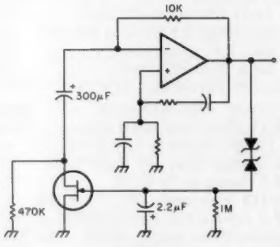

Fig. B.

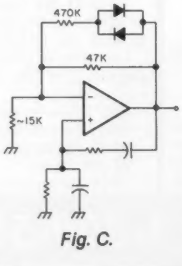

Fig. C.

ter's input jack. The stereo phone plug shown in the photographs fits many older pieces of gear (standard wiring; PTT line to tip, audio to ring, ground to sleeve), but newer equipment may require a different type of connector.

The two-section frequency-select switch turns the oscillators on and off and also introduces a gain of ½ between the active filters and output amplifier during two-tone operation. This attenuator prevents the peak audio output from doubling when both oscillators are on. That convenient feature makes it unnecessary to adjust the transmitter drive level when switching between single- and two-tone tests.

The power supply is a simple rectifier-filter followed by an LM723 regulator set to hold the output at 9 volts. Any dc output voltage from 8 to 20 will power the oscillator; the 9-volt level was chosen to make sure the circuit would work with a battery supply. Two LEDs are used as front-

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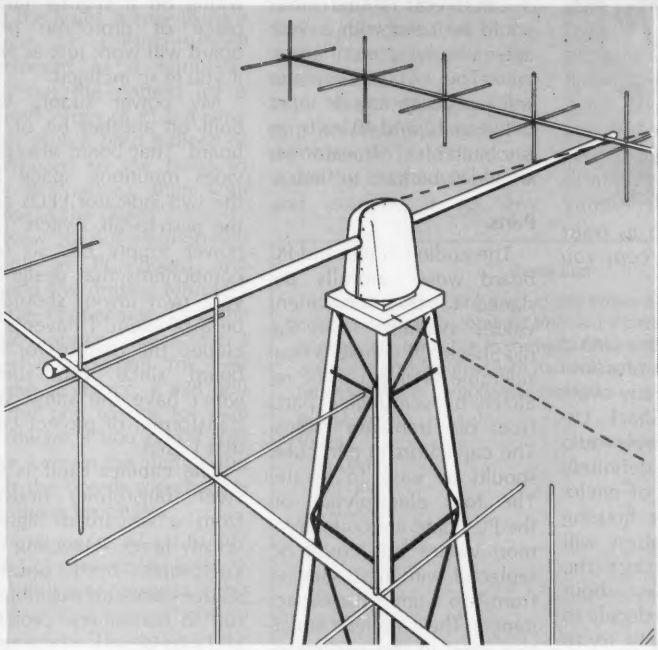

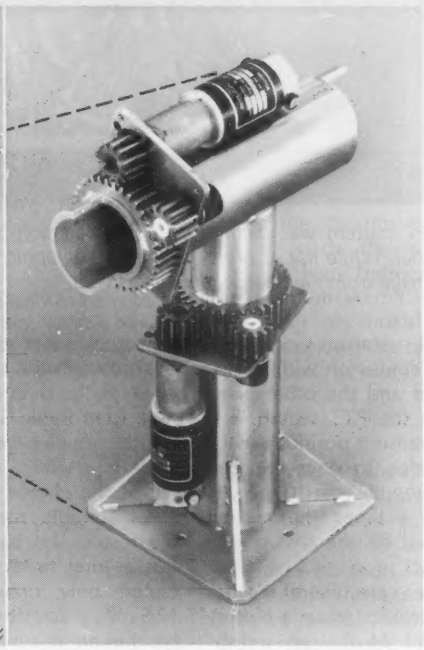

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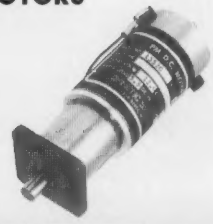

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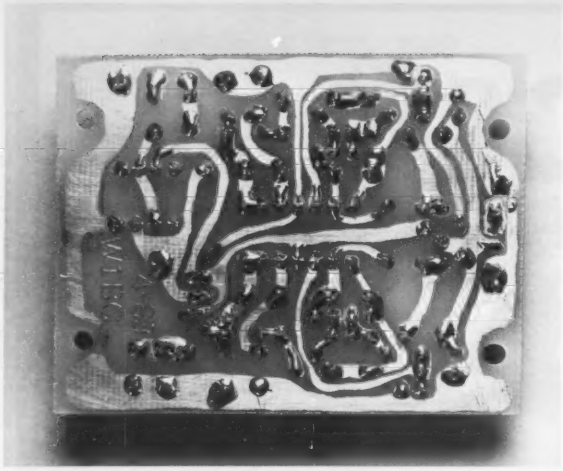
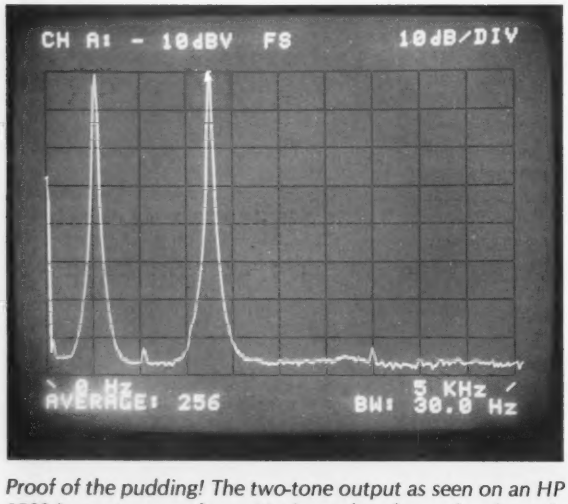


My PC pattern was painted on using nail polish as resist material. While not as pretty as the photographic copy you can make from Fig. 2, it works just as well.

panel status indicators. One comes on with the dc power and the other lights when the PTT switch is in the transmit position. Wired in series to conserve current, the LEDs at 10 mA still draw 4 times the current needed by the rest of the circuit!

There are several reasons to consider using a battery instead of the ac supply. The transformer supply is convenient but bulky. My supply takes up more room than the rest of the circuit even though the transformer is smaller than any available from Radio Shack. Using the smaller 9-volt radio battery will definitely widen the choice of enclosures suitable for housing the tester. The battery will last a long time since the circuit only draws about 12.5 mA. If you do decide to build in an ac supply, try to get a shielded transformer like the one in the photographs. Failing that, be sure to mount the transformer further from the audio circuits than I did to keep 60-Hz hum off the audio signal.

Another alternative is to build the ac supply with a surplus wall-mount transformer of the type used to power calculators. Even a 3- or 6-volt transformer could be used with a voltage-multiplying rectifier circuit. The LM723 regulator will work with any dc input between 12 and 40 volts, so a suitable transformer shouldn't be hard to find.



Proof of the pudding! The two-tone output as seen on an HP 3582A spectrum analyzer. Horizontal scale reaches from dc to 5 kHz, and at 10 dB per vertical division, the largest spurs are 70 dB below the tone peaks. The "signal" at dc is generated inside the analyzer.

Parts

The audio circuits and PC board were carefully designed to use component values available from Radio Shack. Of course, a considerable savings can be realized by scrounging parts from old transistor radios. The capacitors in particular should be easy to locate. The four electrolytics on the PC board are quite common values but could be replaced with units having from 1 to 4 times the capacitance. The smaller capacitors used in the oscillators and filters must be the values specified but are still easy to find on old circuit boards. If you have a choice, stay away from ordinary ceramic capacitors since they're often not as stable as other types. The circuits are relatively insensitive to drift and the ceramic parts will work acceptably, but they should not be your first pick if something else is available.

The two trim resistors should probably be purchased since physical sizes vary widely and the PC layout is tailored to the Radio Shack parts. While not strictly necessary, the use of IC sockets is recommended as they greatly simplify amplifier replacement should the need arise. The switches can be of any size and type which fit the box used for the project.

Construction

The entire oscillator/amplifier portion of this project is built on the single 2" by 2.7" circuit board shown in the photographs and Fig. 2. The printed circuit makes it easy to pack a lot of components neatly into that small space. Point-to-point wiring on a slightly larger piece of prototype perfboard will work just as well if you're so inclined.

My power supply was built on another bit of PC board. That board also provides mounting space for the two indicator LEDs and the push-to-talk switch. The power supply has so few components that designing your own layout shouldn't be a problem. I haven't included the pattern for my board since you surely won't have the same size transformer or project case that I used.

The cabinet itself is the steel transformer housing from a discarded high-intensity lamp. Recycling old enclosures from unusual sources adds an extra bit of fun to home-brew projects and can provide some really custom-looking results as well. In this case, the old scratched-up paint was removed and replaced with a fresh coat of black wrinkle which was in turn oversprayed with light blue. Legend plates of a contrasting color add to the nice appearance, provide a flat surface for the transfer lettering, and also cover up the original holes.

If you want to use a commercially available box, Radio Shack sells several that are suitable. The choice is particularly wide if a battery is used instead of the larger ac-operated supply. Be careful not to buy a plastic box as the lack of rf shielding is an invitation to trouble.

The printed circuit board is a lot easier to make than you might think. If you have access to photographic

equipment, you can turn out a really professional board using the pattern of Fig. 2. Otherwise you can do what I did and get perfectly acceptable results using fingernail polish as resist material.

The pattern in Fig. 2 is full size and the holes are all on 0.1-inch centers. Drilling the holes is easy using a piece of 0.1-inch-spaced perfboard as a template. Cut out the pattern (or a Xerox® copy of it) and carefully glue it onto a piece of perfboard so the holes in the PC pattern align with those in the board.

Now cut out an unetched blank of PC board and clamp the drilling template to the copper side. Drill the four mounting holes first. I used a #33 drill for 4-40 screw clearance; a #28 drill is the one to use for 6-28 hardware if you prefer that size. Loosen the clamps and bolt the boards together using those four holes.

Now you're all set to drill the 122 component holes. A #60 drill is necessary for this and a drill press helps a great deal. The holes in the perfboard force you to drill in the right place; when the boards are unbolted, there'll be an impressively neat array of properly-spaced holes. Sand the copper lightly to remove any rough edges and you're all set to apply the resist pattern.

The pattern of printed circuit runs is simply painted onto the copper surface with nail polish using Fig. 2 and the drilled holes in the board as a guide. Choose a bright red color so the resist will be easy to see against the copper surface. Applying the nail polish with the brush attached to the lid of the jar is easier once about 2/3 of the bristles have been trimmed away with a sharp pair of scissors. Small mistakes with the polish can be scraped off with a pointed knife blade. Really big mistakes can be corrected by cleaning off the entire board with nail-polish remover or a solvent like acetone. *Acetone is serious stuff, so use good ventilation, avoid excess skin contact, and don't work near open flames!*

After the resist is applied, the board can be processed using any of the standard techniques described in the *ARRL Handbook* and elsewhere. Check your work for stray resist material joining runs before dropping it into the bath. When it's done, wash the board with water and examine it for any traces of unetched copper before removing the resist. As a final step after cleaning off the nail polish, run over the board with fine sandpaper or a pencil eraser to brighten up the copper in preparation for soldering.

Mounting the components takes just a few minutes once the PC board is ready. The holes for the two trimpots will have to be drilled out slightly to receive the mounting pins, and that should be done before anything is soldered down. Placement of the various parts is shown in Fig. 3 and the photographs, but if there is any question, the PC patterns can always be checked against the schematic.

The PC pattern in Fig. 2 does not exactly match the board in the photographs. In my unit, the 100-Ohm resistor in series with the 741 output is mounted on the output-level switch. Without that resistor, the 741 oscillates at 2 MHz when the controls are set for maximum output. That happens because the .005-uF bypass capacitor is then effectively connected directly across the op-amp output and it loads the output stage at high frequencies. The problem wasn't noted until after my board was etched, but the resistor cure is included in the Fig. 2 layout.

Parts List

*Items so marked are used in the power supply and may be deleted if power is obtained from a 9-V battery. Suitable components are available from Radio Shack and elsewhere. Several parts are identified with Radio Shack part numbers to better describe the components needed.

Resistors

Value	# Needed	
* 33 Ohms	1	
100 Ohms	2	
270 Ohms	3	
* 1.8k	1	
* 6.8k	1	
15k	9	
22k	5	
33k	5	
47k	2	
470k	2	
10k trimpot	2	RS #217-335
5k pot + switch	1	RS #271-214

Capacitors

* 100 pF	1	
.001 uF	1	
.005 uF	4	
.01 uF	2	
.022 uF	2	
.1 uF	1	
2.2 uF, 16 V	3	
33 uF, 16 V	1	
* 220 uF, 35 V	1	

Semiconductors

* LM723 voltage regulator
LM324 quad op amp
741 op amp
* 100 PIV, 1 Amp or more bridge rectifier RS #276-1171
LEDs (2 required)
1N914 small signal diodes (4 required)

Miscellaneous

* Power transformer
DPDT (center-off) toggle switch RS #275-1545
SPST switch
IC sockets
PC or prototype board
Cabinet
Mike plug
* Line cord

Checkout

The board should be checked before final assembly into the cabinet. Temporarily solder on the switches with short lengths of wire and connect a scope or ac voltmeter to the output terminal. Hook a 9-volt supply to the power-input pad and ground and verify that the circuit draws about 2.5 mA. Now set the output attenuator to the high range (22k resistor shorted), flip the mode switch to the 500-Hz position, and adjust RT1 until the output level is exactly 1 volt rms (2.8 volts p-p on the scope). Then switch the mode switch to the 1750 position and adjust RT2 to give the same reading. When both tones are on, the output will read 0.7 rms, but the peak-to-peak level will still be 2.8 volts.

If the circuit doesn't work straight away, check the mode-switch wiring and the amplifier dc output levels. It's unlikely that you made a major PC board error, but solder splashes or stray whiskers of unetched copper are always a possi-

bility. Several strategic voltage levels are shown on the schematic for help in troubleshooting. The ac levels will change with trimpot settings and in any case must be measured with an ac-coupled voltmeter. The ac-voltage ranges of most VOMs will respond to either ac or dc voltages. That problem is easily cured by placing a 2-to-30-uF capacitor in series with the meter. The dc voltages noticed should be independent of switch or trimpot settings, as the dc bias on the amplifiers is determined only by the power-supply level.

Putting It All Together

One disadvantage of working with high-purity signals is that they are so easily corrupted by poor assembly practices. Hum levels unobjectionable in other applications can significantly compromise the quality so carefully designed into this circuit. Because of that, there are several things to watch out for when the board is mounted into its metal enclosure. The power transformer, especially if it doesn't come completely encased in a metal shield, will be surrounded by 60-Hz magnetic fields. Keep it as far as possible—preferably 2 or 3 inches—from the oscillator circuit board. Arrange things so the various control leads leaving the board are short, direct, and away from the transformer and ac wiring.

One particular problem is hum coupled from the ac switch leads running to the back of the output potentiometer. Use relatively small wires for this purpose, tightly twisted to provide a measure of magnetic shielding. Notice in the photograph that those wires approach the potentiometer from the back while the audio connects to the front. The ac leads are also dressed perpendicularly to the circuit board instead of running alongside it.

Despite these precautions, the wires in my unit couple a small 60-Hz signal into the channel occupying one side of the circuit board. The hum is 70 dB below the oscillator tone and could probably be reduced further by electrically shielding the wires with some braid taken from a short length of RG-58. I didn't bother because the hum is no larger than some of the other spurious signals and few sideband rigs will respond to inputs at 60-Hz in any case. I had the means to measure that hum, however, and you may not, so take some extra care when positioning things in your box.

The metal case is connected to the circuit ground at only a single point: the hole where the shielded microphone cable leaves the box. This single-point grounding eliminates some potential sources of noise by separating signal currents from whatever noise currents might be flowing in the shield wall.

Test equipment is often seen as a corner that's all too easy to cut. Perhaps infrequently used, often expensive, usually bulky, it's just easier to put up with antiquated gear or do without altogether. The older equipment, while better than nothing, is often basically unsuited to an amateur's needs. You'll find this two-tone tester, even if you only use it once or twice a year, a convenient gadget well worth having. Small and inexpensive, yet reliable and easy to use, it's a good solution to several transmitter testing problems. The high-quality output also will put an end to any nagging concerns about the purity of the audio you've been getting from that old patched-up kit oscillator! ■

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Yaesu, Icom Graft Revealed

Splice Icom's headset to Yaesu's talkie and discover handie happiness.

One of Icom's accessories for their VHF handie-talkies is the HS-10 headset and its accompanying HS-10SB switch box. Priced at just under $40.00, this headset with its attached boom mike is perfect for mobile use with a handie-talkie. Instead of holding the heavy transceiver up to your mouth to talk and up to your ear to hear, you simply slip the headset over your head and ham it up in comfort. The HS-10SB switch box is a necessary companion to the headset since it contains a small mike preamplifier (which boosts the audio so you don't have to talk directly into the boom mike) and a push-to-talk (PTT) switch which has both momentary-on and locked-on positions.

As soon as I saw this handy device, I decided that I had to make it work with my Yaesu FT-208R transceiver. This article describes the modifications needed to make it work.

The modifications consist of two parts: Cut off the Icom mike connector and substitute a Yaesu connector, and make a few minor changes to the HS-10SB switch box.

Fig. 1 shows the diagram of the original switch box. The mike signal is applied to a 2k volume control, and its output is then amplified by a one-transistor amplifier. The output is then sent, through the PTT switch, to the transceiver through the white wire in the coiled cord. The white wire actually serves three purposes:

(1) It carries amplified mike audio to the transceiver.

(2) It provides several volts of dc to the mike amplifier when the PTT switch is closed. This voltage provides the Vcc (collector supply voltage), base bias, and also a bias to the electret mike itself (through the 2k volume control).

(3) It also keys the transceiver when the PTT switch is closed.

Speaker output coming in on the red wire is sent to the earphone in the headset through a 33-Ohm resistor to slightly reduce the volume level. In addition, a 10-Ohm resistor provides the load for the transceiver's audio amplifier.

Finally, ground is connected through the shield in the coiled cable as well as through the blue wire.

The PTT circuit in the Icom combines mike audio, PTT, and Vcc voltage on one wire. The transceiver's battery connects to the white wire through a resistor. When the PTT switch is closed, the transceiver detects the slight voltage drop across that resistor and keys the transmitter. At the same time, this resistor also supplies the required voltage for the amplifier and electret mike.

The mike interface in the Yaesu FT-208R is completely different. It uses a six-pin mike connector which provides separate pins for audio in, PTT, and Vcc for a mike amplifier or for mike bias. An advantage of this scheme is that the Yaesu dis-

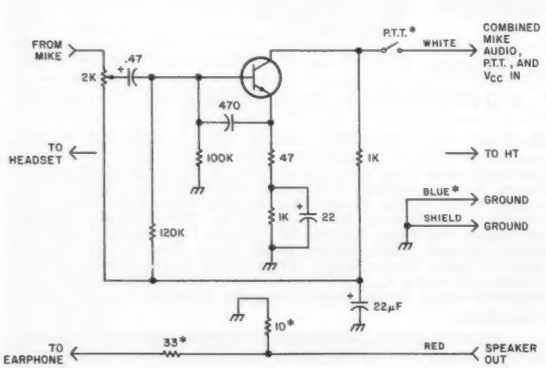

Fig. 1. The original circuit of the Icom switch box. Asterisks show components to be removed or rewired—see text.

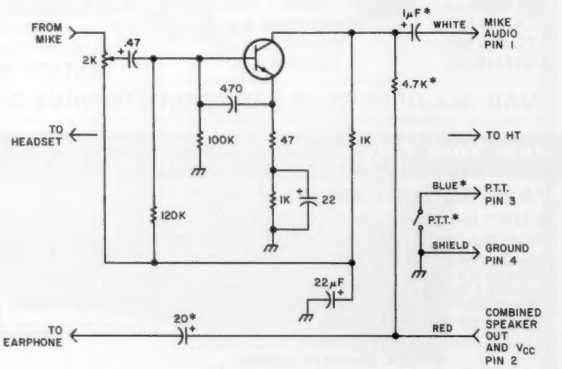

Fig. 2. Modified Icom switch box for use with Yaesu FT-208R. Asterisks show new or rewired components.

ables the built-in mike on the handie-talkie when the remote-mike PTT switch is closed. In addition, the speaker output from the Yaesu radio carries a dc voltage, which requires a slightly different earphone circuit as well.

Fig. 2 shows the modified circuit of the switch box (asterisks in Figs. 1 and 2 identify those components which have to be changed or added).

In Fig. 2, a 1-uF capacitor is used to isolate the amplifier output from the white wire. This prevents dc voltage from being fed back into the transceiver's mike circuit. Likewise, a 20-uF capacitor couples speaker audio from the transceiver to the earphone and prevents dc from getting to the earphone. Both capacitors are electrolytics or tantalums, and polarity must be as shown in the diagram.

A 4.7k, 1/4-Watt resistor is added to provide the required dc voltage for the amplifier and mike circuit. Although the Yaesu has a separate dc output on its connector, that output cannot be used because it would require one more wire in the coiled cable. Since the cable only has three leads plus a shield, I chose to get the dc voltage from the speaker output.

Finally, the PTT switch is wired directly between the PTT pin and ground.

All of the added components and wires fit neatly into the HS-10SB switch box as long as you use very small capacitors and are careful about component placement. There are several obstructions in the case, and you may have to bend the leads in several places to allow the case to close. As shown in Fig. 2, the original Icom cable is also used, although the blue wire has to be unsoldered from the ground connection and reused for its new purpose.

On the transceiver end, you will have to cut off the original Icom connector and substitute the required Yaesu connector. I obtained mine by calling Yaesu (see their ad in this issue). Although the connector is tiny and requires care in soldering, it was not particularly difficult. It has six pins, though only pins 1 through 4 are actually used in this modification. Fig. 3 shows the pin layout of that connector on the FT-208R, but note—it is possible that the orientation of the connector on your rig may be different from that on mine. Use an ohmmeter to identify pin 4, the ground pin, before you start to work.

I took one shortcut in this design that you should be aware of. In the original Icom design, power is applied to the microphone circuit only when the PTT switch is closed during transmitting, whereas my circuit applies power during receiving as well. This introduces an extra battery load of slightly over 1 milliampere. I decided that this was not important and let it go. But if you feel strongly enough about it, there is a way out. The PTT switch in the switch box is a DPDT switch, with the two sections paralleled. By disconnecting one section of the switch and placing it in series with the new 4.7k resistor, you can ensure that the mike amplifier is powered only when the PTT switch is pressed. ■

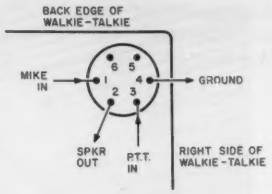

Fig. 3. Yaesu microphone connector pin layout.

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At the Arecibo observatory, the sky's the limit. Who said size doesn't matter?

The Arecibo observatory on Puerto Rico holds several records in the field of radio. Its antenna, with a diameter of 1000 feet, is the largest antenna in the world. The 450-kW output of the S-band (2.400 MHz) transmitter together with the gain of the antenna, which at this frequency is estimated to be 72 dB, make the signals from Arecibo the strongest signals to leave Earth. Although higher resolution can be achieved by other radio telescopes by coupling two or more of these together, the Arecibo observatory still has the highest sensitivity to weak signals from space.

The observatory is located about 6 miles from the port city of Arecibo, near the north coast of Puerto Rico. The landscape around the observatory is very beautiful and scenic, consisting mainly of limestone hills and valleys covered with lush tropical vegetation.

The 1000-foot reflecting antenna makes the Arecibo observatory a very conspicuous landmark when seen from the air. The reflecting dish was constructed in a natural limestone sinkhole, the shape of which was such that only small excavations were necessary to make room for the huge reflector. The surrounding limestone hills are helpful in shielding the observatory from man-made radio noise. The isolated location of the facility adds to this protection.

The reflector at the Arecibo observatory is mounted firmly in the ground, in contrast to other radio telescopes which search the sky by moving the entire antenna dish. Radio telescopes are usually constructed with a parabolic reflecting dish, but in order to be able to search the sky without moving the entire reflecting dish, a different shape had to be chosen for the Arecibo reflector. It has, therefore, been shaped like a section of a perfect sphere. With this construction, the observatory can be steered by moving secondary antennas which are receiving the signals that are being reflected from the dish. These secondary antennas are mounted on a triangular platform about 450 feet above the reflecting dish. The platform is suspended by steel cables from three towers that have been built around the edge of the reflector.

The 1000-foot reflecting dish at Arecibo was built in a natural limestone sinkhole.

Radio telescopes with parabolic reflectors have a point-like focus. The secondary antenna or feedhorn which receives the signals from parabolic reflectors has to be mounted at the focal point in front of the dish. But the focus of the Arecibo observatory, with its spherical reflector, is along a line above the reflecting dish. The secondary antennas, therefore, have to be suspended above the reflector and must be able to pick up signals along that line.

The position of the platform and the secondary antennas must remain very stable, even in strong winds. The necessary stability has been accomplished through a great deal of sophisticated engineering. The platform is triangular, and its weight is 600 tons. A circular track, 130 feet in diameter, has been mounted under the platform. The feed arm is a structure which can rotate under these tracks. The feed-arm structure itself has a pair of tracks on its underside. These tracks are curved, so that all points along these tracks are an equal distance from the reflecting dish underneath. The secondary antennas are mounted on two carriages which can move along the tracks under the feed-arm structure. These two carriages will normally be positioned in such a way that they counterbalance each other.

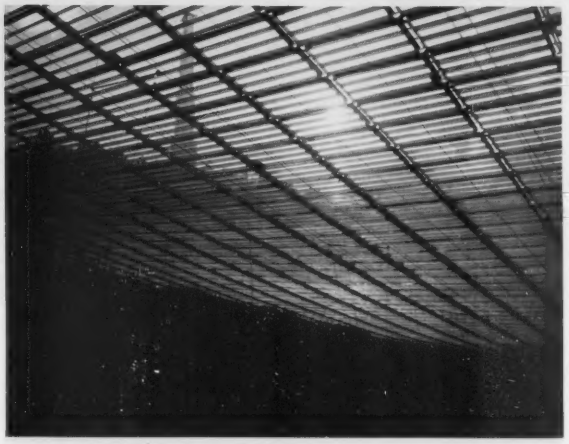
The antenna dish consists of almost 39,000 aluminum panels. These panels are perforated so that about 44 percent of the sunlight can reach the ground underneath the dish. The sunlight which passes through the dish allows vegetation to grow underneath. Without this vegetation, rainfalls would cause severe erosion of the landscape underneath the platform.

A square of laser-reflecting material has been mounted on each aluminum panel. A laser system can check the shape of the reflecting dish by bouncing light off each of these squares. A computer is then able to calculate the position of each panel to within 1/8 of an inch. The position of each panel can be accurately adjusted from underneath, and this is done whenever a sufficiently large deviation from the ideal shape of the dish has been detected.

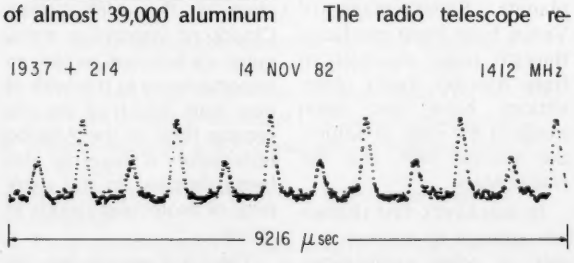
A laser system is also used to maintain the position of the platform within very narrow tolerances. A laser reflector is mounted at each of the three corners of the platform. Whenever a computer detects a significant change in the position of the platform through this system, it can regulate the tension on tie-down wires that are connected to each corner of the platform. By controlling the tension of these wires, any change in the position of the platform can be neutralized.

The radio telescope receivers are mounted inside the carriages that suspend the secondary antennas. All electronic components generate small amounts of electrical noise which is proportional to the temperature of the components. If the receivers were to work at room temperature, the internal noise would be stronger than most of the weak signals which the observatory is receiving from space. For this reason, the front end of the receivers is cooled by a refrigeration system using liquid helium. The boiling point of liquid helium is 4.2° Kelvin, and at this temperature the receivers are capable of detecting extremely weak signals from space.

The transmitters at the Arecibo observatory are being used for ionospheric research and radar studies of the solar system. These transmitters also are mounted in the carriages in order to

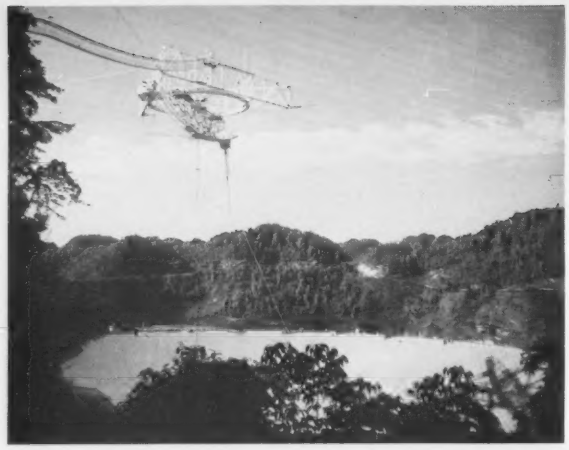


The aluminum panels are perforated so that much of the sunlight can pass through. Vegetation can therefore grow under the reflecting dish, preventing erosion of the landscape.



Printout of the signal from the very fast pulsar, 4C21.53, as this was detected at the Arecibo observatory on November 14, 1982. This pulsar rotates 642 times each second and transmits one of the larger and one of the smaller pulses during each rotation.

Workmen on the reflecting dish are using shoes which distribute their weight over a large area, like snowshoes. Walking on the reflecting dish is now being avoided, and almost all adjustments and repairs are being done from the underside.



The platform structure weighs 600 tons. Most of the antennas which receive the signals that are reflected from the reflecting dish are mounted on two carriages which can move along the curved track on the underside of the platform.

minimize losses in the transmission line. If coaxial transmission lines were to be used to carry the output from transmitters on the ground to the platform, the losses would be substantial at the high frequencies that are being used.

The power supply is often the heaviest part of a radio transmitter. Therefore, the power supplies for the transmitters are mounted in buildings at the edge of the reflector. Thick dc cables carry the voltages from these power supplies to the transmitters under the platform. When the radar transmitters are being used, a great deal of waste heat must be dissipated from the transmitting tubes. In order to cool these effectively, water circulates through them. Water hoses connect the transmitters with the water supply on the ground.

The observatory has been built so that a single observer can control the entire facility. The observer can steer the carriages under the platform with extreme accuracy from computers in the control room. These can therefore counter the rotation of Earth with a very high degree of exactness.

The Arecibo observatory at sunset.

All signals that are received at the Arecibo observatory are processed by computers in the control building. The frequency of the received signals can be determined to a fraction of a cycle even at microwave frequencies. Doppler shifts and emission lines in the signals from space can thus be determined. The time of arrival at the antenna for received radio signals can also be measured with an extreme accuracy.

The Arecibo observatory can at any time study a circular area of the sky about 40 degrees in diameter. This area is centered at local zenith. Due to the rotation of Earth, about 39 percent of the sky is available for observation from the Arecibo observatory. Unlike optical observatories, radio telescopes can observe the sky in daylight and during cloudy conditions. Only during strong electrical storms may a radio telescope be unable to observe.

Radar astronomy has recently contributed much to our knowledge of objects in the solar system. This technique detects the reflection of man-made signals from objects in space. The Arecibo observatory is our most sensitive radar-astronomy instrument. Through radar observations from Arecibo, the rotation period of Venus was determined for the first time. It also was determined that Venus rotates in the opposite direction of other planets. Radar maps of Venus have been produced through radar observations from Arecibo. Radar observations have also been made of the rings of Saturn, the asteroid belt, and the planet Mars.

In mankind's first deliberate attempt to announce itself to other civilizations, the enormous output power of the Arecibo radar transmitter at 2.400 MHz was used. A message was beamed to several segments of the sky in 1974. The message was coded in a binary code and contained information about mankind, Earth, and the solar system.

The first quasar was discovered by the Arecibo observatory in 1964. These remarkable objects, which are believed to be located at the center of extremely distant galaxies, emit enormous amounts of radio waves and other types of electromagnetic waves.

Pulsars are objects that emit radio waves that turn on and off rapidly. These are believed to be rapidly-rotating neutron stars that emit radio waves from the magnetic poles. Each time a rotating magnetic pole sweeps past Earth, another pulse can be detected at Arecibo. Although the first pulsar was found by an English radio telescope, many of the numerous pulsars that since have been detected were found first by the Arecibo observatory.

Galaxies are not distributed evenly throughout the universe but seem to be concentrated in clusters, superclusters, and huge filaments in space. In between there are huge voids with few or no galaxies. The Arecibo observatory has devoted much of its observing time to the mapping of galaxies and systems of galaxies.

The Arecibo observatory, together with other radio observatories, has been able to identify a number of molecules in the space between stars in the Milky Way. Clouds of interstellar molecules are believed to play an important role in the birth of new stars. Much of the observing time at the Arecibo observatory is therefore also being devoted to the mapping of molecular clouds in space.

The US Congress has decided recently to fund a program which will search for radio signals from other civilizations in our galaxy. This program, which is being

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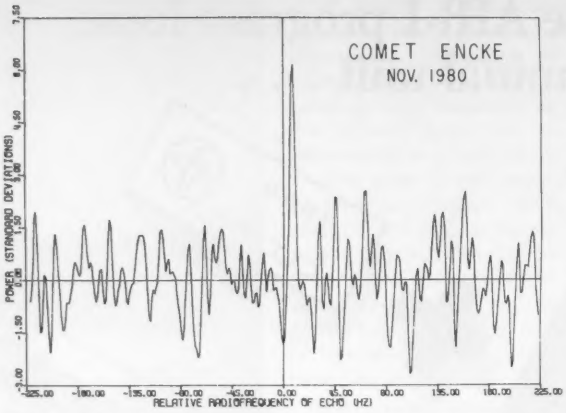
managed by the National Aeronautics and Space Administration, will cost two million dollars each year. A number of radio telescopes will be used in this program, including the Arecibo observatory. In the next few years, between five and ten percent of the observing time at Arecibo will be used in the search of signals from other civilizations.

During their journey out into space, the two *Voyager* space probes are making continuous observations of cosmic rays, magnetic fields, and the solar wind. As the most sensitive radio-receiving instrument on Earth, the Arecibo observatory will be able to receive signals from these space probes long after they have become too faint for other radio telescopes. If no malfunction occurs in the radio transmitters aboard these space probes, their signals should be detectable at the Arecibo observatory for at least 30 more years.

The Arecibo observatory, which was completed in 1963, is being operated by the National Astronomy and Ionosphere Center at Cornell University. About 100 persons are employed at the observatory in Arecibo, and another 40 persons are working at Cornell University's Astronomy Center in Ithaca, New York. Observing time at the observatory is available to astronomers from all countries.

The Arecibo observatory is being improved constantly as new equipment and technologies become available. The observatory has contributed much to our knowledge and understanding of the universe during the past 20 years. It is likely that the Arecibo telescope will remain one of mankind's most sensitive and versatile astronomical observatories for many years to come. ■



Radar echoes from the nucleus of the comet Encke were detected by the Arecibo observatory in November, 1980. This is the first detection of the nucleus of a comet. The strength of the received echo indicates that the nucleus has a diameter of about 2 miles. The rotation and speed of the nucleus can be determined from the Doppler shifts in the echo.

References

1. The National Astronomy and Ionosphere Center: *Arecibo Observatory*, Office of the University Publications, Ithaca, 1981.
2. L. M. LaLonde: "The Upgraded Arecibo Observatory," *Science*, October 18, 1974, pages 213–218.
3. James C. G. Walker: "Radar Measurement of the Upper Atmosphere," *Science*, October 12, 1979, pages 180–189.
4. William E. Shawcross: "Arecibo Observatory Today," *Sky and Telescope*, April and May, 1972.

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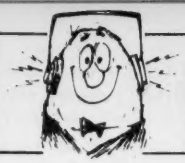

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Digital frequency counters have long been a favorite means of measuring the frequency of operation of radio transmitters, but until recently their cost has been prohibitive for amateurs. Until about a decade ago, only the wealthiest shops and laboratories could afford a counter. Most commercial service shops of that era used heterodyne frequency meters, not counters.

In the early seventies, however, costs started falling. The 5-kilobuck 500-MHz counter dropped in cost to about 2 kilobucks. During that same period, the first amateur-grade counters were on the market. Heathkit™ offered their IB-101. That counter sold for around $200 in kit form and operated to 15 MHz (my sample actually worked well to 23 MHz). Today, amateur-grade counters can be bought for less than $100 and operate to frequencies up near 600 MHz.

The photographs show three different models which represent the types used by amateurs. The Heath IM-2410 (Photo A) operates on frequencies up to 225 MHz. This is a basic counter with the minimum features needed. The Heath IM-2400 shown in Photo B is also a basic counter but is hand-held and portable. The IM-4110 shown in Photo C is more than a basic counter; it contains a number of interesting features. It is a frequency counter (to 110 MHz) and also will measure events and period. The period-measurement function also measures period average, which is the period measured over 10 seconds.

Photo A. The Heathkit IM-2410 portable frequency counter.

The advances in digital electronics over the past decade coupled with rapidly falling IC prices have made amateur use of counters possible. Even though counters are low cost now, they are not foolproof. There are problems in operation that cause erroneous readings—or no readings at all.

In this part of my two-part series, I will discuss the basic theory behind digital counters. In part II, I will discuss some of the nuances of digital frequency-counter (DFC) operation.

Digital Counter Basics

A single article cannot fully discuss enough digital electronics unless a few assumptions are made. For those who want more detailed treatment, I recommend my digital electronic series in *73* for September through November, 1982. In this article, I will reiterate only a small amount of the digital-basics series.

A flip-flop (F-F) is essentially a 1-bit memory element. There are several different types of flip-flops, but the type which concerns us here is the J-K flip-flop shown in Fig. 1(a). There are two complementary outputs on the F-F, labelled Q and $\overline{Q}$ (i.e., "not-Q"). Since these outputs are complementary, one will be HIGH when the other is LOW; these outputs will never be at the same level.

There are five inputs on the J-K F-F. These inputs are: J, K, clock, set, and clear. The J and K inputs are essentially control inputs; their use will be explained shortly. The clock input synchronizes the F-F operation and usually has a square wave applied. The set input is

used to force the F-F to the state where Q=HIGH and $\overline{Q}$=LOW. Clear is just the opposite; it forces the outputs to the state where Q=LOW and $\overline{Q}$=HIGH. The usual circuit symbol is that of Fig. 1(a). This example, incidentally, uses active-LOW set and clear inputs, which is the usual case in TTL devices. We do, however, sometimes see active-HIGH inputs.

Fig. 1(b) shows the truth table for the unclocked (or direct mode) operation. In this mode, the J-K F-F doesn't care what the signals at the clock or J-K inputs are doing. Only the set and clear inputs are used. Since our example uses active-LOW inputs, the state in which both set and clear are LOW is disallowed. In that case, the poor flip-flop won't know what to do. If the set is made LOW, the Q output goes HIGH and not-Q goes LOW. If set is HIGH, and clear is LOW, we see exactly the opposite situation: Q is LOW and not-Q is HIGH. If both set and clear are HIGH, then the F-F will be in the clocked mode of operation.

The truth table for clocked operation of the J-K flip-flop is shown in Fig. 1(c). The clock synchronizes the operation of the J-K F-F; all action takes place on the negative-going (i.e., HIGH-to-LOW) transition of the clock signal. In all cases of clocked operation, the set and clear inputs must remain HIGH. The programming of the F-F takes place on the J and K inputs.

If both J and K are LOW, then there will be no change on the Q and not-Q outputs regardless of clock-input

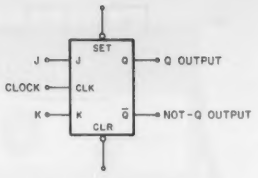

Fig. 1(a). A J-K flip-flop.

transitions. In this condition, the J-K F-F is locked.

If J is LOW and K is HIGH, the Q output will be LOW and not-Q is HIGH. Action takes place on the negative transition of the clock line.

If J is HIGH and K is LOW, then the Q goes HIGH and not-Q is LOW. As in the previous case, the transition occurs on the negative transition of the clock line.

If both J and K are HIGH, then the outputs will go to the opposite state. If, for example, Q=HIGH, then on the negative transition of the clock line the Q output will go LOW. Similarly, if Q had been LOW, the clock transition would have made it go HIGH. This is the condition used in digital-counter circuits and results in binary frequency division.

Fig. 2(a) shows a two-stage binary divider based on J-K flip-flops, while Fig. 2(b) shows the timing waveforms. Note that on both flip-flops the J and K inputs are tied HIGH. The outputs are Q of F-F 1 (i.e., Q1), and Q of F-F 2 (i.e., Q2). The input signal is applied to the clock of F-F 1, while the clock of F-F 2 uses the Q1 signal as its input.

In the timing diagram, the negative-going transitions are labelled T1, T2, T3, and T4. At time T1, the input signal makes a negative transition, so Q1 snaps HIGH; Q2 remains LOW. The Q1 output remains HIGH until the next negative-going transition of the input signal, at time T2. At this time, the clock input of F-F 2 sees Q1 drop LOW, so it will cause Q2 to snap HIGH. At time T3, another input negative-going transition occurs, so Q1 goes HIGH again; it will remain HIGH until the next negative-going transition at time T4. At T4, both the clock inputs of F-F 1 and F-F 2 see negative-going transitions, so both Q1 and Q2 go LOW.

Note what has happened in Figs. 2(a) and 2(b). There are four input pulses, yet Q1 produced only two output pulses; F-F 1 acted as a binary divider (i.e., divide-by-2). Similarly, the input of F-F 2 sees the two pulses at Q1 and produces one output pulse; F-F 2 also acted as a binary divider. Thus, the output of F-F 2 is one-fourth the input frequency. In a cascade chain of J-K F-Fs the binary division will be 1 (i.e., the input frequency), 2, 4, 8, 16, 32, and so forth.

A decade counter is a divide-by-10 (i.e., base-10) counter. Such a counter circuit is needed in decimal-counting systems used in our digital frequency counters. Unfortunately, there is no 10 in the 2, 4, 8, 16 sequence of a four-stage binary counter. We can, however, make a decade counter from a four-stage binary (i.e., base-16) counter by causing it to reset to 0000 after the tenth input pulse. Such a circuit is shown in Fig. 3(a), while its timing is shown in Fig. 3(b).

The decade counter is a base-16 binary counter modified by the addition of a NAND gate (G1). The timing diagram shows the circuit action. The output of G1 is

J	K	SET	CLEAR	CLOCK	Q	$\overline{Q}$
×	×	0	0	×	DISALLOWED	
×	×	0	1	×	1	0
×	×	1	0	×	0	1
×	×	1	1	×	NORMAL CLOCKED OPERATION	

NOTE: 1 = HIGH
0 = LOW
× = DOESN'T CARE

Fig. 1(b). Truth table for the unclocked mode of operation.

J	K	SET	CLEAR	CLOCK	Q	$\overline{Q}$
0	0	1	1		NO CHANGE	
0	1	1	1		0	1
1	0	1	1		1	0
1	1	1	1		GOES TO OPPOSITE	

NOTE: 1 = HIGH
0 = LOW
× = DOESN'T CARE

Fig. 1(c). Truth table for the clocked mode of operation.

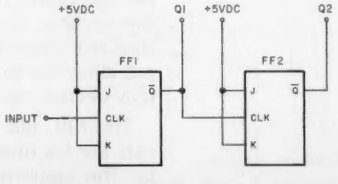

Fig. 2(a). Two-stage binary divider based on J-K flip-flops.

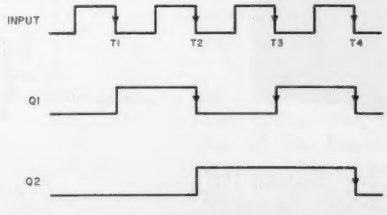

Fig. 2(b). Timing waveforms for Fig. 2(a).

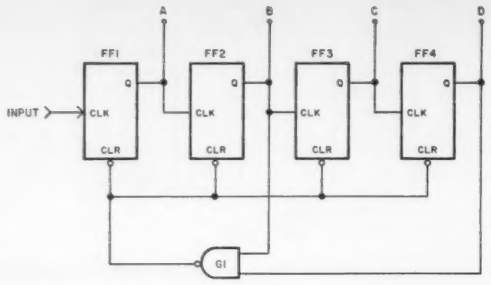

Fig. 3(a). Four-stage binary-counter circuit.

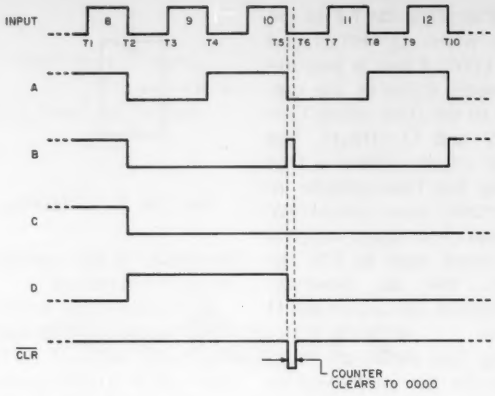

Fig. 3(b). Timing waveforms for Fig. 3(a).

connected to a common clear line. When this line drops LOW, the outputs of the counter go to 0000_2. The inputs of G1 are connected to the B (i.e., Q2) and D (i.e., Q4) flip-flop outputs. If B and D go HIGH simultaneously, then the output of G1 goes LOW and all four flip-flops will be reset. The only time these conditions are met is at T5—see Fig. 3(b). Following T5, the counter is 0000_2 and begins all over again.

The A, B, C, and D outputs form a four-bit binary-coded decimal (BCD) "word" that denotes the ten digits of the decimal numbers system. This code results in ten unique binary codes. These BCD codes are shown below:

D	C	B	A	Decimal
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9

There are a number of IC digital counters on the market. One of the oldest is the 7490 TTL device. The 7490 is a biquinary counter, i.e., it contains one divide-by-2 counter stage and one divide-by-5 counter stage. When the output of the binary stage is connected to the input of the quinary stage (i.e., pins 1 and 12 are shorted together), the 7490 becomes the decade counter of Fig. 3(a).

Most modern frequency counters made today do not use the 7490 but rather will use MSI or LSI multi-stage counters. We will, however, use the old-fashioned 7490 device here to illustrate a principle that would be lost in the maze of an MSI device. Fig. 4 shows a decimal counting unit (DCU) based on the 7490 and certain companion chips, the 7475 quad-latch, and 7447 BCD-to-seven-segment decoder.

A DCU will count by tens and produce a decimal output. In the case of Fig. 4, the display device is the familiar seven-segment LED decimal display. This form of display uses seven lighted bars (designated a, b, c, d, e, f, and g) to represent the ten digits of the decimal system.

The 7447 receives a BCD 4-bit word at its inputs and causes the appropriate outputs (a–g) to drop LOW. When an output is LOW, the corresponding segments of the display turn on. Besides the BCD inputs, there are also a test input, a ripple blanking input (RBI), and a ripple blanking output (RBO).

The test input is sometimes called $\overline{LT}$, for "lamp test." When the test input is brought LOW, all 7447 outputs go LOW. This situation forces the seven-segment display to show an 8. This input allows us to test the display decoder device.

The RBI and RBO terminals are for ripple blanking, i.e., the suppression of leading zeros. Let's consider a

Photo B. The Heathkit IM-2400 hand-held frequency counter.

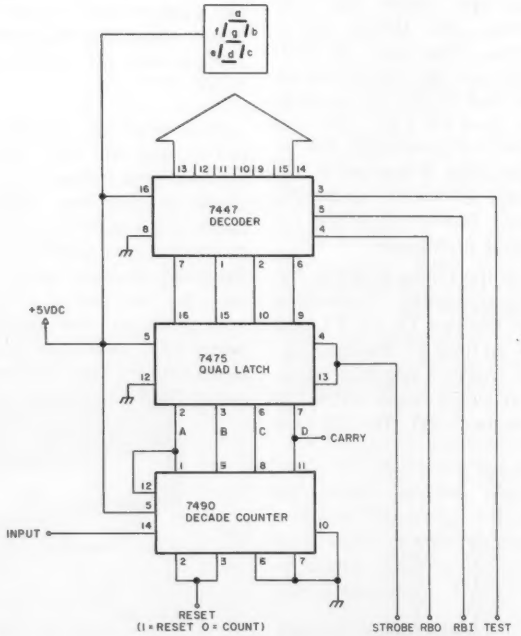

Fig. 4. A decimal counting unit.

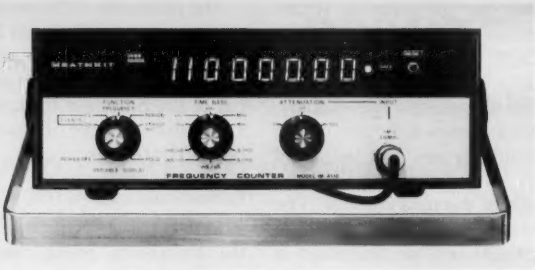

Photo C. The Heathkit IM-4110 frequency counter.

situation. Suppose our eight-decade counter measures a frequency of 21390 kHz. Without ripple blanking, the reading would be "00021390." If we provide blanking, however, we can turn off those leading zeros and display 21390. If a LOW is placed on RBI, the display will turn off if the applied BCD word is 0000_2. The RBO output goes LOW if the BCD input is 0000_2. Thus, by daisy-chaining the RBO outputs to the next least-significant RBI inputs, the leading zeros are suppressed.

The 7475 is quad-latch, i.e., a four-bit memory. Inside the 7475 are four type-D flip-flops. These F-Fs are arranged in two groups of two each. Each group of two has a common clock line. In Fig. 4, the clock lines are tied together to form a common strobe line. When this line is made HIGH, the BCD word at the 7475 inputs is transferred to the outputs. Thus, we can use the strobe line to update the display only after the decade counter has finished counting.

A decimal counting assembly (DCA) is made by cascading two or more DCUs. The D output of less significant DCUs is connected to the input terminal of the next significant DCU. We require one DCU in the DCA for each decimal digit of the DCA.

Frequency Counters

A digital frequency counter measures events per unit of time (EPUT) to form a DFC; we arrange a DCA so that input pulses are counted for a specific period of time (e.g., 1 second, or subdivision thereof).

Fig. 5(a) shows the basic block diagram for a frequency counter. The sections include the DCA, main gate, trigger, input amplifier, main-gate flip-flop, timebase, and a display clock.

The DCA is a totalizer counter as shown in Fig. 4. The overflow stage is a flip-flop that is SET when the MSD carry output goes HIGH. The overflow flip-flop turns on a lamp to make the operator aware of the overflow condition so that the data can be disregarded.

Since a frequency counter measures events per unit of time, i.e., cycles per second, the DCA must be turned on only for a given period of time (e.g., 0.1, 1, or 10 seconds). The main gate, main-gate flip-flop, and timebase sections are used to allow input pulses into the DCA for the designated period of time.

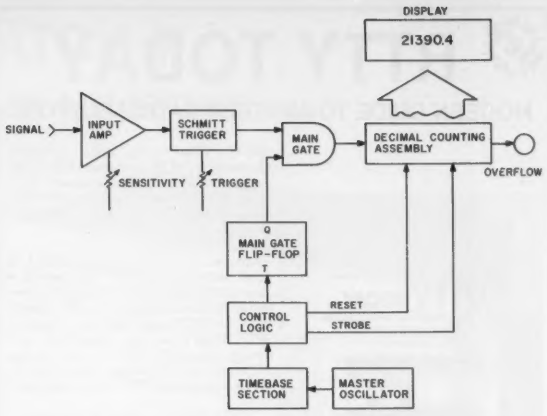

Fig. 5(a). Frequency-counter block diagram.

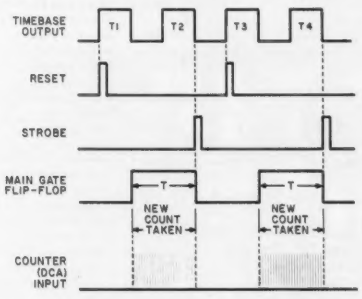

Fig. 5(b). Waveform for Fig. 5(a).

The timebase section consists of a crystal oscillator that produces pulses at a precise rate such as 100 kHz, 1 MHz, 4 MHz, etc. A chain of decade dividers such as the 7490 is used to reduce the crystal-oscillator frequency to a lower frequency. The timebase-output frequency will be 10 Hz for 0.1-second, 1 Hz for 1-second, and 0.1 Hz for 10-second measuring periods.

The timing diagram for one complete interval of an EPUT counter is shown in Fig. 5(b). Pulses t1, t2, and t3 are output from the timebase section. When t1 goes HIGH, the control-logic section generates a short pulse to reset the DCA to zero. When t1 goes LOW again, the Q output of the J-K main-gate flip-flop will go HIGH. The main (AND) gate has one input tied to the Q output of the flop-flop, and the other input is tied to the signal being counted. As a result, the main gate passes input pulses to the DCA only when the Q terminal of the flip-flop is high.

The flip-flop remains set until the negative of t2 occurs. At that time, the Q output of the flip-flop drops LOW, turning off the flow of pulses into the DCA, and causes the control-logic sec-

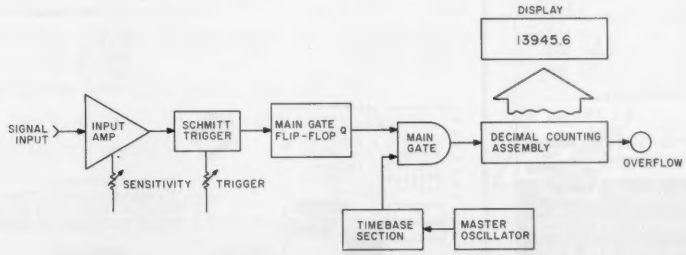

Fig. 6. Period-counter block diagram.

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tion to generate a strobe pulse. This pulse tells the DCU latches to transfer data from the counter to the decoders. The display, then, shows only completed count cycles and will hold the previous count until the end of the next interval. (The trigger and input amplifier circuits will be discussed in part II of this article.)

The frequency counter of Fig. 5(a) counts frequency, i.e., events per unit of time, because the DCA is enabled only for a specific unit of time. The frequency of the input signal is the number of counts accumulated on the DCA divided by the timebase period in seconds. The basic formula, with P=time in seconds and f=frequency in Hertz, is f=counts on DCA/P. Therefore, P=DCA count/f. For example, if the DCA count is 8026 and the timebase frequency is 10 kHz, then $P=8026/10^4=0.8026$ seconds.

The resolution is the smallest time interval that can be measured on the counter and is defined as the reciprocal of the timebase frequency. In this example, it would be $1/10^4=0.1$ ms.

Period Counters

Period is the reciprocal of the frequency being measured: $P=1/f_{Hz}$. We can use the digital counter to measure period by reversing the roles of the timebase and input amplifier trigger. In Fig. 6 we see the block diagram of a period counter; compare with Fig. 5(a). Note that the main-gate flip-flop is turned on and off by the output of the input-signal trigger. The DCA is actually counting the number of timebase pulses between successive input pulses.

In part II, I will discuss DFC applications and some of the problems that arise in less-than-ideal practical situations. ■

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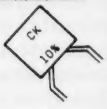

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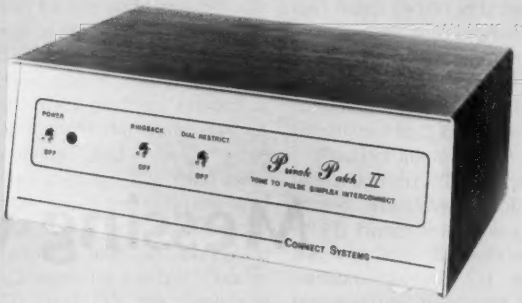

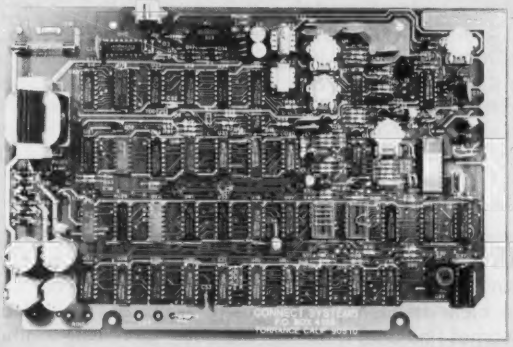

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Messing with Heath

This 101 control mod proves fun and easy with frequency. Your rig deserves it.

A remote vfo is useful for a lot more than just chasing DX. You can search for a clear frequency (and sometimes find one) without giving up the original, or stay with a net while moving off frequency to pick up side traffic and intercept QRM. In a contest, you might leave the main vfo on a pileup and tune the remote down the band for a few points. By switching back and forth, you can keep track of the pileup without sacrificing other contacts.

A second vfo will also serve as an RIT if your rig doesn't have one and could even be set up to monitor two frequencies at once. Of course, when you aren't doing any of these, you *can* use it to work DX stations on split frequencies.

Even though Heath didn't offer a matching remote for the HW-101, it's neither expensive nor difficult to add this versatile accessory to your HF lineup. The HW-101 will work with a variety of vfo circuits, and interfacing one to your rig is a simple procedure.

Suitable Donors

The search for a compatible unit is made easier by realizing that several Heath products were designed around the same vfo parameters. This means that an LMO (linear master oscillator) taken from a worn-out SB-101 transceiver or SB-400 transmitter, for example, will perform as well as a vfo retrieved from a junked HW-100 or HW-101.

Photo A. A duplication of the HW-101's internal vfo is installed in a recycled Heath VF-1 cabinet. The original vfo in this 25-year-old box could drift through most of a band in one evening. Perfect for gradual QSY in a contest.

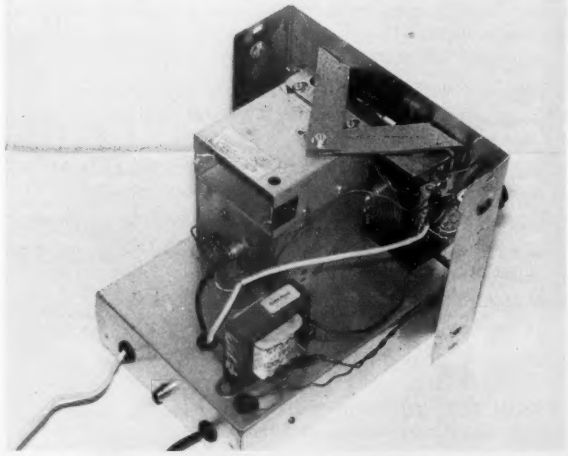

Photo B. A prototype remote using an SB-102 LMO. This version is self-powered by an on-board 10-V-dc supply.

Old, abused, and just plain broken Heathkit/HF products are often available at bargain prices. Aside from providing the vfo you want, these castoffs will give up a wealth of good reusable parts and a cabinet for your next project.

If you don't turn one up that way, consider building a clone of the HW-101's internal vfo. Obtain the enclosure, variable capacitor, and other critical components from Heath. The tube and hardware are commonly available. You might devise your own dial assembly, or buy those parts from Heath, too. Consult the owner's manual for Heath part numbers.

Duplicating the internal vfo costs more than building a generic 5-MHz circuit, but it does have the advantage of guaranteed compatibility. Also, having step-by-step instructions in the manual eliminates all the guesswork and simplifies alignment.

A Heath SB-640, although rare, is a prize find. This is a remote LMO once sold as a companion to the SB-101, but it makes an excellent remote for the HW-101. Locating one of these also saves the trouble of installing an unattached vfo into a new cabinet.

If you're willing to experiment, you might find a usable vfo in a discarded piece of non-Heath equipment. Any "backwards-tuning" 5.5–5.0-MHz unit capable of 1.5 volts rms across 50 Ohms should have potential.

Finally, some commercially-made auxiliary vfo's are compatible with the HW-101. Buy-and-try is the method here, but the Kenwood 520 and 820 products should be safe bets. For the dedicated build-it-yourselfer, some other sources are mentioned later. The installation/interface tips described in this article are generally applicable to almost any combination you decide to try.

The Basic Remote

Fig. 1 shows the setup used with a duplicate HW-101 vfo, whether salvaged or built from scratch. This arrangement also covers home-built or other tube-type vfo's requiring 150 volts. A small 12-volt-dc supply is built into the transceiver to power the new relay, K1, and an RIT relay (if used) in the new vfo. This dc source is usable with other modifications, too. Spare contacts on the antenna relay provide 12 V dc at separate points in both receive and transmit modes. Through switch S1, this control voltage determines when relay K1 is activated, placing the outboard vfo into operation.

The relay can be mounted in any convenient location; I attached it with an L-bracket to the rf cage. The rectangular cutout in the rear panel is an almost perfect fit for a nine-pin molex®-type female connector (Radio Shack #274-239). Either a new phono socket or the spare on the rear apron becomes the "vfo in" connector.

As indicated in Fig. 1, some minor rewiring of the regulated 150-V-dc line and vfo input is needed. This is done to route them through the new relay instead of direct to the internal vfo. These changes are straightforward and easily reversible.

Fig. 1 also shows the control switch and "on-site" wiring of the remote unit. With S1 in its first position, the main vfo is always used. In the next position, control is split, with the main unit receiving and the remote transmitting. The third position is just the opposite, and the fourth position puts the remote unit in complete transceiving control. Diodes D1 and D2 are "one-way signs." They prevent the control voltage from running backwards down the wrong line when the switch is set for remote transceive. For example, the RIT relay would be useless without D1.

The Better Remote

Aside from the benefits of dual-frequency control, an LMO offers dial accuracy approaching the level of digital readout. The circular dial reads 0–100 kHz rather than 0–500 and rotates five times per band segment instead of once. The 1-kHz markings can be visually interpolated to 200 Hz.

Another advantage is that warm-up drift is almost eliminated. The LMOs stabilize much faster than the original vfo and the solid-state version operates at room temperature in its own cabinet. This limits warm-up drift to the hfo circuit in the transceiver, which is minimal. With all this in mind, you may find yourself using the remote LMO most of the time. It's worth a little effort to find one.

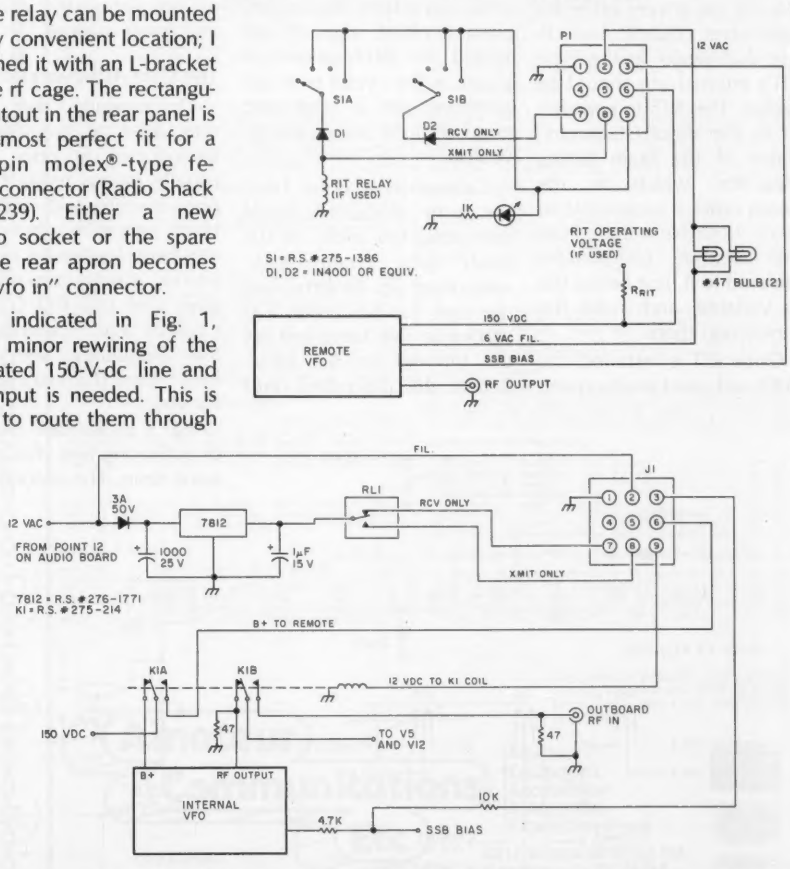

Fig. 1. Relay and 9-pin socket connections inside the HW-101. The 12-volt supply can be built on a terminal strip. Also shown is the remote-unit wiring. P1 is at the end of a 7-wire cable and mates with J1 on the transceiver rear panel.

Depending on how old it is, an LMO-equipped Heathkit will contain either a tube-type or solid-state unit. The older ones (and the SB-640 remote) require 150 V dc and should be set up the same way as the vfo in Fig. 1.

The later LMOs do without the tube and operate on +10 V dc regulated. Fig. 2 shows the changes in the interfacing arrangement and a power supply for the LMO. You could get by with a ten-volt zener on the relay supply, but the circuit shown is sturdier, safer, and more reliable. Be sure to adjust the regulator for ten volts output before connecting it to the LMO. The Fig. 2 method is readily adaptable to other solid-state remote units requiring 9 to 13 volts.

You may want RIT in the remote, especially if you plan to use it very often for transceiver control. Any circuit that works in the HW-101's internal vfo should be usable. The RIT is connected to the stator (stationary) plates of the main tuning capacitor, which in the Heath LMO is impossible to reach. Look for a tinned bar with several components soldered to it, just below the air variable, and make the connection there.

Once RIT is installed, the LMO will need realignment.

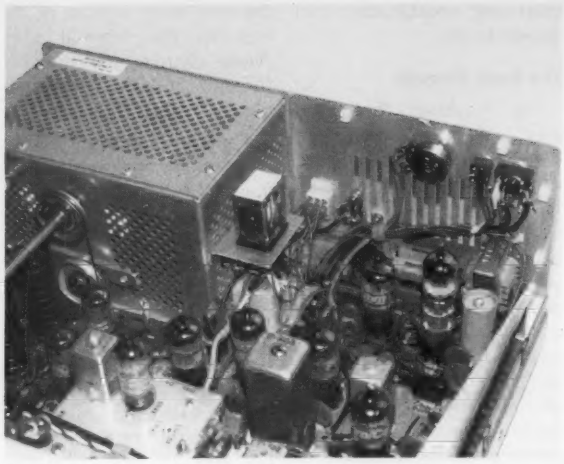

Photo C. Close-up of the HW-101 showing suggested locations for relay K1, the 9-pin socket, and remote-input phono socket.

Even without this modification, some of the more battered LMOs I've used required touching up. These units came from the factory pre-assembled, aligned, and sealed. No information was given on the circuit or its adjustment, so I tried and erred until the secret was revealed.

Calibration is done from the front of the enclosure with insulated tools. At 0.0 (shaft fully counterclockwise, then up 10 kHz), set the coil for 5.5 MHz. Go clockwise five turns and set the trimmer for 5.0 MHz. Repeat this procedure until one turn of the shaft changes the frequency exactly 100 kHz. Take some time doing this, and you'll end up with an exceptionally accurate and linear readout.

The Over-Achiever's Remote

Occasionally the need may arise to monitor two frequencies at once. This usually means trying to impress a visitor with your station's versatility, but there are more legitimate uses. If you've always envied the guys who call CQ DX and casually add, "Listening on this frequency *and* 7090 kHz," then this extra step is for you.

Fig. 3 shows one method of activating two vfos at the same time. The second new relay (K2) is drawn in squares to distinguish it from control relay K1. Whichever vfo is not being used will be turned on and connected to the mixer inputs by closing K2. This results in both units controlling a received frequency independently but simultaneously.

This system is foolproofed against transmitting on two frequencies by powering K2 from the receive-only 12-V-dc source. The relay automatically opens when the rig is in transmit mode. Nevertheless, a prominent warning light should be included as a reminder that the transmitted signal may not be in the same place as the one you're listening to.

The circuit in Fig. 3 is limited to remote vfo's that do not take their B+ voltage from the 150-V-dc line in the HW-101. The OA2 regulator tube can't handle two vfo's at the same time. If this feature is important to you, either a solid-state remote unit or a separate 150-volt supply will be needed.

Mount the second relay next to K1 and keep rf leads short and direct. Some solder-and-try with the .005 discs may be necessary if unwanted oscillation occurs.

Some Other Approaches

You may find, or already own, another Heath rig with the right vfo/LMO. If it's not ready to retire for parts, it

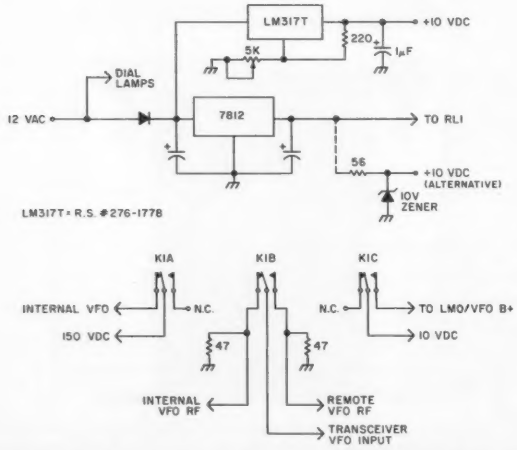

Fig. 2. An adjustable-output power supply and the third pole of relay K1 are used for solid-state remote units.

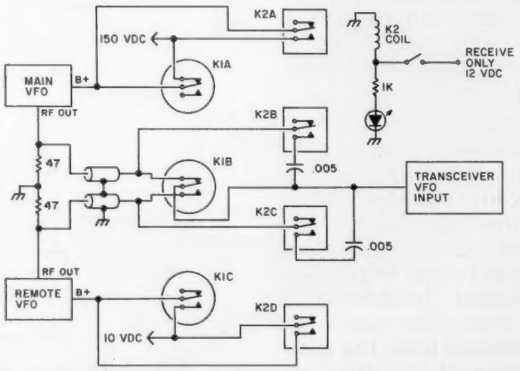

Fig. 3. A second relay (K2) is used for receiving two frequencies at the same time.

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can be set up easily to function either normally or as a remote vfo.

For example, an SB-303 receiver's LMO can be used exactly as shown in Fig. 2. Mount the control switch in a separate box or in place of an expendable receiver control such as the rf attenuator. LMO output is available on the rear panel. If operating voltage is brought to the LMO through spare phono sockets, the receiver itself need not even be turned on. In the same way, an SB-110 six-meter transceiver could "loan out" its LMO when not otherwise occupied.

If by choice or necessity you build an outboard vfo, you would probably save some time by referring to previous articles on Heath companions. In "An External Vfo for the Heathkit SB-101" (*CQ*, September, 1972), K4TP described a tube-type unit. His circuit uses commonly-available parts and a simple dial mechanism.

VK5JZ/SK built a two-transistor version which is described on page 23 of the ARRL's *Weekend Projects for the Radio Amateur*. Look through back issues of *73* for other articles that may include a 5-MHz circuit. One in particular which has potential is VE5PZ/s "An 820S Remote Vfo," in *73* for June, 1981.

These circuits should be "laundered" through a buffer. The triode section of tube V5 is not used in the HW-101 but functions as a buffer in the SB-series transceivers. By adding a few parts, V5B can be put back to work. See Fig. 4. The new components will fit into vacant holes surrounding V5 since the same circuit board was used in both transceiver types.

Refer to Fig. 1 and treat the buffer as though it were the remote unit. The actual outboard can be left on continuously or switched along with the buffer. But remember the limitations on the built-in 150-volt regulator; it won't run two of anything at once.

The V5B buffer should also benefit some other vfo's you might build or buy that don't perform properly with the HW-101. Low power output is one symptom, oscillation in the mixer is another. The buffer is more forgiving of impedance mismatch and too-high vfo output than the mixer stage.

Another step that's likely to improve compatibility is also shown in Fig. 4. The SB-100 series had more sophisticated mixer input circuits which can be added to the HW-101. Again, vacant holes are available on the bandpass board.

The SSB bias line shown with the Heath remotes is used to offset the vfo frequency when changing from LSB to USB or CW. Recalibration of the dial is then unnecessary. This feature could be included in home-built or other circuits, but probably is not worth the trouble.

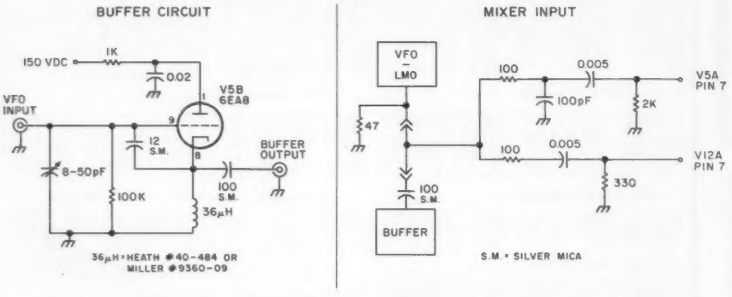

Fig. 4. A buffer for non-Heath vfo's and improved mixer input circuit.

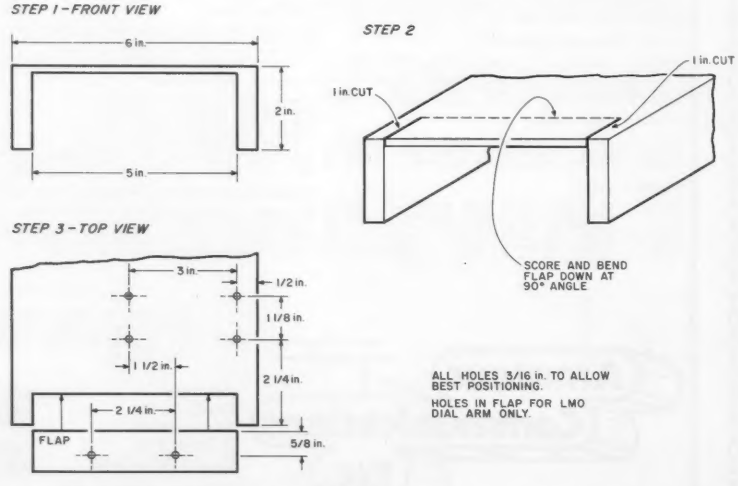

Fig. 5. Three steps to a chassis for Heath vfo/LMOs. One—cut out 5" of chassis front. Two—make 1" cuts on top, score between them, and bend down. Three—drill mounting holes as shown. Use the front panel from an HW-101 or donor equipment as a template for the dial mounting.

Summing Up

Length of connecting coax cable and terminating resistance is considered critical with many vfo designs. In fact, Heath specifies 24 inches of RG-62 (93-Ohm coax) for interconnecting their LMOs.

At different times I've used an HW-101 vfo, several LMOs, and a few workbench contrivances. In no case was anything more than a convenient length of RG-58 needed for good performance. But don't overlook the 47–68-Ohm resistor at the mixer input and careful vfo alignment.

There's no disputing that the HW-101 is an economy radio, but you're in the company of many loyal and satisfied owners. A remote vfo will open the door to more enjoyable HF operating with a small investment of money and time. It's a very effective way to make the most of hamming on a budget.

Let me know if you encounter any problems, and I'll help if I can. ■

References

Malin, "Increasing the Operating Capability of the Heathkit SSB Transceivers," *CQ*, August, 1972.
Heathkit Owners' Manuals for models SB-640, SB-102, and SB-401.

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Built-in 300 watt, 50 ohm dummy load, built-in 4:1 ferrite balun.

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6-position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.

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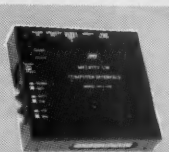

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Has mark and space outputs for scope tuning.

Normal/Reverse switch eliminates retuning.

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Easy, positive tuning with twin LED indicators.

Narrow 800 Hz active CW filter. Automatic PTT.

Exar 2206 sine generator for AFSK output.

Shielded XCVR AFSK/PTT interface cable provided. Plus or minus CW keyed output. FSK out.

Powered by computer (few ma.), no power adapter to buy or extra wire to dangle or pick up/radiate RFI.

Glass epoxy PCB. Aluminum enclosure. 4½x4½x1".

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Use MFJ, Kantronics, AEA and other RTTY/ASCII/AMTOR/CW software.

Copies all shifts and all speeds. Twin LED indicators makes tuning easy, positive. Normal/Reverse switch eliminates tuning for inverted RTTY. Speaker out jack. Includes cable to interface MFJ-1224 to VIC-20 or Commodore 64. 4½x1¼x4¼ inches. 12-15 VDC or 110 VAC with optional adapter, MFJ-1312, $9.95.

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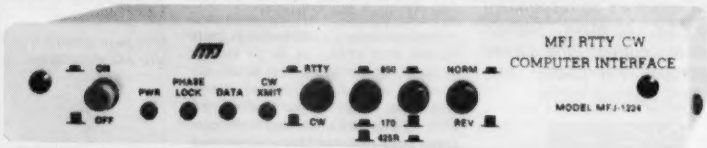
Lets you send and receive computerized RTTY/ASCII/AMTOR/CW. Copies all shifts and all speeds. Copies on both mark and space. Sharp 8 pole active filter for 170 Hz shift and CW. Plugs between your rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 or other personal computers. Uses MFJ, Kantronics, AEA software and other RTTY/CW software.



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Easy, positive tuning with twin LED indicators.

Copy any shift (170,425,850 Hz and all other shifts) and any speed (5-100 WPM RTTY/CW and up to 300 baud ASCII).

Copies on both mark and space, not mark only or space only, to improve copy under adverse conditions.

Sharp 8 pole 170 Hz shift/CW active filter gives good copy under crowded, fading and weak signal conditions. Automatic noise limiter suppress static crashes for better copy.

Normal/Reverse switch eliminates retuning. +250 VDC loop output drives RTTY machine. Speaker jack.

Automatic tracking copies drifting signal.

Exar 2206 sine generator gives phase continuous AFSK tones. Standard 2125 Hz mark and 2295/2975 Hz space. Microphone line: AFSK out, AFSK ground, PTT out and PTT ground.

FSK keying output. Plus and minus CW keying. CW transmit LED. External CW key jack.

Kantronics compatible socket.

Exclusive general purpose socket allows interfacing to nearly any personal computer with most appropriate software. Available TTL lines: RTTY demod out, CW demod out. CW-ID input, +5 VDC, ground. All signal lines are buffered and can be inverted using an internal DIP switch.

Use Gaifo software with Apple, RAK with VIC-20, Kantronics with TRS-80C, TI-99, N4EU with TRS-80 III, IV. Some computers with some software may require some external components.

Metal cabinet. Brushed alum. front. 8x1¼x6 in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

MFJ-1223, $29.95, RS-232 adapter for MFJ-1224.

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CW INTERFACE CARTRIDGE FOR VIC-20/C-64

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4 pole 100 Hz bandwidth active filter. 800 Hz center frequency. 3 pole active lowpass post detection filter. Exclusive automatic tracking comparator.

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Includes Basic listing of CW transmit/receive program. Available on cassette tape, MFJ-1252(VIC-20) or MFJ-1253(C-64), **$4.95** and on software cartridge, MFJ-1254(VIC-20) or MFJ-1255(C-64), $19.95.

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73 INTERNATIONAL

Each month, 73 brings you ham-radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Perry Donham KK2Y.*

AUSTRALIA

J. E. Joyce VK3YJ
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Australia

VK9Y—COCOS KEELING

First discovered in 1609 by William Keeling of the East India Company, these islands are located 2768 km northwest of Perth, West Australia.

The Cocos Keeling group consists of two main atolls plus several smaller islands. The main islands are West Island, Home Island, and Direction Island, with the other larger ones being Prison, Horsburgh, and North Keeling. On these islands, the highest point above sea level is only six meters, which poses some problems annually during cyclone season.

Except for the odd sailing ship stopping there briefly over the centuries, the islands remained uninhabited until 1825 when Alexander Hare settled there, followed two years later by the first of the Clunies family.

In 1886, Queen Victoria granted all of the islands' lands above high water mark to the Clunies-Ross family, thereby starting a family tradition where the head of the family was called "King of the Cocos."

When Clunies first settled on these islands, he bought with him several Malays as workers on the islands' only commodity, copra. There are now 370 direct descendants of these original Malays, a very family-conscious and happy people who call themselves "Cocos Malays." They speak both Malayan and English and follow the Muslim religion.

The rest of the islands' population consists mainly of Australians on a two-year tour of duty with one of our government departments.

Radio was first introduced to these islands in 1914, when there was a cable and wireless station located on Direction Island. In the 1940s, an airstrip was built on West Island which has since been upgraded to take large jet aircraft, one of which is the fortnightly commercial flight from Australia.

In 1978, the Australian government bought most of the islands from the Clunies-Ross family for $6.25 million, and at present, it is trying to buy what is left of the family estate.

This year, the Cocos Malays are to be given, under United Nations supervision, a free choice as to whether they wish to have independence, free association with, or integration with Australia. As there is much travelling by the islanders between Cocos Keeling and Australia and they come under the West Australian Health, Dental, and Schooling System, the feeling is that soon we will have another 370 Aussies and permanent jurisdiction over the Cocos Keeling Islands.

Amateur radio is a late comer to these islands, with VK9AJ, as far as records show, being in 1956 the first to activate amateur radio from Direction Island. Since then, there have been many operations by outsiders since none of the local Malay population has taken up amateur radio, although several do operate CB equipment. The operation of amateur radio has become extremely difficult of late, however, due mainly to there being no tourist facilities on the island, and the only way to stay for a short period is to be invited to live at someone's house. This poses some problems as all the Cocos Malays' homes are closely grouped together, with a large number of TVs, broadcast receivers, cassette recorders, and VCRs (the amateur's nightmare).

I quote part of a letter to me from Neil VK6NE/VK9YE: "To operate and not create TVI/BCI, or bad neighbor relationships, is very difficult in the living area. To use over 25 Watts will get you into some appliances. 100 Watts is OK if you tee it up with the neighbors beforehand, for a few hours operation only. 400 Watts and you will be put away. No way will the island's Administrator allow you to stay if you don't stop making the appliances emit strange sounds, and the Administrator's word is law on these islands."

Two of the most active operators of late were Paul VK9YB and Alex VK9YA, due to jobs with one of our government services which took them through there on a fairly regular basis. They have been reassigned now and are inactive from this spot, but even they could get into trouble.

One example of the problems in operating amateur radio from here happened to Alex VK9YA. Deciding to get on the air from the single-men's quarters during one of his many stopovers, he fired up his rig late at night, only to find an irate neighbor at his door. It seems that as the island's own 50-Watt broadcast transmitter goes off air during the night and starts up first thing in the morning, this chap was leaving his clock radio switched on, with the volume turned up full as a wake-up alarm. You can imagine what happened when Alex fired up his HF gear from two rooms away; the neighbor, not being interested in amateur radio, was turning very nasty and made Alex shut down his operation.

Cress VK9YC, whose home callsign is G5NDS, did not have these problems, as he is a son-in-law of the Clunies-Ross family and operated from its castle-like home on Home Island. However, with the negotiations by the Australian government trying to buy this property, you may not hear Cress from there again.

Mike Beall VK9ZYX, a limited license holder, in his shack on Cocos Keeling. Limited to 52 MHz and above, Mike still gained many awards on the 6m band.

Frank VK9NYG at his operating desk on Cocos Keeling.

A DX expedition, even if allowed to operate (which I doubt), would not be warranted, going by the figures given to me by Paul VK9YB. Out of 2500 contacts during his last stay, only 125 sent cards direct, some with no return postage included and some with only one IRC. It is worth mentioning here that we have one of the highest postage costs in the world, with air mail to the States now 75 cents and Europe 85 cents. Of the rest of his contacts, he is now getting 400 cards per month by the bureau, with a large number of SWL cards.

Perhaps the above is due to Frank VK9NYG, a Novice operator who, although limited in power and bands of operation, had, during his two-year tour of duty on the islands, 22,000 contacts (some duplicates, of course). Of these, Neil VK6NE, Frank's QSL manager, says that 6,500 cards were sent back direct, regardless of whether or not sufficient return postage was included, and 7,800 cards were sent by the bureau. Not a bad tally for a Novice operator, mainly operating on 28 MHz with 30-Watt PEP output. 21 MHz was there as a backup but seldom used.

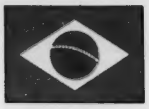
Frank enjoyed a unique relationship with the islanders, as the radio telephone on the islands shut down at night and sometimes was not at all reliable during the day. The islanders found that they could use Frank to get info for them from the mainland, and he was able to be of assistance to yachts in trouble in the area of the Cocos Keelings. This gained him some acceptance for amateur-radio operation not granted to other amateurs. Frank and his wife Ann are back in Australia, and Frank has upgraded to a full call, now being VK6ACC.

Incidentally, Neil VK6NE is also the WIA's Federal QSL Manager, and he spent two weeks as VK9YE, operating from Frank's shack, before Frank left the islands.

With the Australian government just finishing building a six-million-dollar high-security quarantine station out there, casual visits by amateurs or anybody else will be even harder in future, and unless we get an active amateur posted to one of the government departments on the islands, I feel VK9Y will slowly start to creep up the most-wanted list again.

As Melbourne is a long way from Cocos Keeling, I must thank Neil VK6NE/VK9YE, Paul VK5CGR/VK9YB, and Ken VK3AH, who together gave me most of the information for this article.

P.S. I have just received word that the Cocos Malays just voted on their future and the vote was overwhelming in favor of integration with Australia. To use a typical Australian expression, "Bewdy mate, she's a bottler decision!"



BRAZIL

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RECIPROCAL AGREEMENT

One day before my last trip to the United States, which was on April 7, I received a telephone call from Ricardo A. A. da Silva PT2RS, one of the members of the Brazilian Amateur Radio League (LABRE) staff. He lives in Brasilia, the capital city, but he was in Rio de Janeiro for a few days due to his job.

First of all, he passed on the message from Valmir Jacinto Pereira PT2FA, president of LABRE, congratulating *73* for the opportunity it gave us, through our column, to make known a few things about Brazilian amateur-radio activities.

The president also wishes to extend an invitation to all foreign authorities of the countries with which Brazil does not have yet a reciprocal agreement to get in touch with the Brazilian League in order to work on this agreement. Up to now, Brazil has reciprocal agreements with West Germany, Bolivia, Canada, Chile, Colombia, Costa Rica, Denmark, the US, Great Britain, Northern Ireland, Panama, Paraguay, Portugal, Dominican Republic, Sweden, Switzerland, Uruguay, and Venezuela.

According to Brazilian law, it is not allowed for a foreign citizen, while in Brazil, to have or use any communication equipment if the country of which he is a citizen does not have a reciprocal agreement with Brazil. Transgressing this law will result in the confiscation of the equipment, the detention of the violator for one to three years, or his banishment from the country. All inquiries and general correspondence to the League should be addressed to the administrative headquarters at SCE Sul, Trecho 4, Lote 1-A, 70000 Brasilia, DF, Brazil, or to PO Box 07.0004, 70000 Brasilia, DF, Brazil. Telephone: (061) 223-1157 or (061) 226-0504.

EUGENIO'S FIRST CRY

This happened in the city of Fortaleza and was reported by America PY7VBG: When little baby Eugenio was born on December 8, 1982, nobody could imagine that his first cry would be transmitted on the air on a frequency full of friends of his mother, Maria PT7LB. When Maria arrived at the hospital to have her baby, at about 4:00 am, the only room available did not have a telephone, so she decided to keep with her the 2-meter hand-held equipment to get in touch with her husband; he had had to return to their home to stay with the other children, who had remained sleeping.

According to her doctors, Braga PT7WFB and Lazaro PT7HP, the baby would be born at about noon. However, at about eight o'clock in the morning, while speaking with her friends on the frequency, she felt the first hurt, and a few minutes later the first cry of Eugenio was transmitted on the air and heard by all friends who were on the frequency.

Without a license, Eugenio had to finish his first transmission a few seconds after the beginning, and then he went to his birthplace for sleeping.

CWP AWARD

Issued by CW Petropolis, the CWP award may be obtained in three different classes. Contacts eligible: only two-way CW mode, after December 1, 1983.

Class I—Work 10 Brazilian cities plus 2 contacts with CWP members or delegates.

Class II—Work 20 Brazilian cities plus 4 contacts with CWP members or delegates.

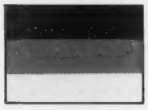
Class III—Work 30 Brazilian cities plus 6 contacts with CWP members or delegates.

One CWP member or delegate may be logged more than once, but only if worked on different dates or bands.

SWL: Same rules.

No QSL, only GCR. Fee: 7 IRCs. Mailing address: CWP, PO Box 90415, 25600 Petropolis, RJ, Brazil.

CWP members: KA9KUH, PP2ADY, PP7JCO, PT2ACZ, PT2GK, PT7WA; PY1s: AFA, APS, AYE, AZG, BPR, BVY, CC, DFF, DK, DMX, DRW, DWM, DYO, EBK, EBN, ECL, EWN, JF, KT, MIT, OB, PL, QN, QQ, RD, TBW, TG, UBS, URQ, UTZ, UUW, UWI, VEC, VMV, WXU, YOC, YOV, ZFF; PY2s: AC, IL, KQ, MC, MT, ORW, RLQ, RRG; PY3CJI, PY3MQ, PY6AMJ.



FEDERAL REPUBLIC OF GERMANY

Hans J. Schalk DJ8BT
Hammarskjold-Ring 174
D 6000 Frankfurt 50
Federal Republic of Germany

IARU REGION 1 CONFERENCE, 1984

The IARU Region 1 Conference, 1984, took place from April 7th to 13th, in Cefalu, Sicily. Back in 1981, the last Region 1 Conference, in Brighton, UK, had voted for Italy by a plurality.

During such meetings, which are held every three years, the member national societies agree democratically to important decisions and suggestions for the future. That means that single-nation interests have to be combined on a level which is acceptable for every member. In the voting, each nation has one vote whether it has 50,000 members (as for example, the DARC—Deutscher Amateur Radio Club) or only 40.

Very often the negotiations are extremely difficult and many result in a compromise. So not seldom discussions last until the late night. The official language of the conferences is English, and procedures are parliamentary procedures according to Roberts Rules.

Three committees were set up in 1981 to report this year. Committee A is dealing with shortwave and administration subjects, Committee B with subjects concerning VHF/UHF, and Committee C with financial subjects.

As already mentioned, some small teams had to be founded (besides the three committees) to handle negotiations successfully. That means that a national society wanting to bring its interests into several subjects has had to have number of delegates to spread around.

A great deal of preparational work is done by these teams—HF WG (High Frequency Working Group), VHF/UHF WG, and other teams—in the time between conferences. But their suggestions are not binding because not every nation's interests have been represented. For suggestions to come into force, the whole conference has to agree.

The executive committee has suggested changing this procedure to introduce written voting so that decisions also could be made during the three-year period between conferences. DARC supports this proposal.

In a future column I will report on results, but you may be interested in other matters under discussion.

Because of the increasing numbers of QSL cards, we think it advisable to propose a standardization regarding card size and address field. (Naturally it will take several years until the standards have become common use.) Similar efforts towards standardization have been made within the two other regions. According to our experiences, we think a possible compromise would be: size 9 × 14 cm, weight 190–250 grams/sqm, address in the 12-mm leftover space at the end of the QSL (for an automatic handling of the cards).

In addition, we want considered additional regional subsidies to our local AMSAT organizations. We also suggest stopping unnecessary use of special prefixes for eacl: and every thing. Further, we appeal for reflection upon the existing RST system for an easier way of evaluation. QRK expressed "R 1–5" seems to be sufficient.

It is already known that RSGB (UK) wants a change of the bandplan within the 28-MHz band. RSGB intends the integration of an FM-repeater range. SSA (Sweden) proposes producing and publishing a communication manual to improve radio discipline. Also they suggest a coordination of the intruder monitoring service within Region 1.

According to resolutions of Region 2 (America) and Region 3 (Asia) conferences, a uniform QTH-locator system seems to be possible now. Also, there are suggestions to reduce the 24-hour contests to 12 hours and eventually to hold two contests on the same weekend.

GREAT BRITAIN

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THE UK SCENE

Band occupancy is a problem to which I have referred in previous columns in connection with the need to continue to use the 10-meter band during periods when propagation is poor. Most people seem to accept the possibility of such bands being lost to broadcasting or to CB if used only once every 11 years or so.

However, the need to demonstrate that amateur allocations are not a waste of valuable spectrum is not confined to HF. Indeed, the pressures from the likes of land mobile PMR (private mobile radio) and military users in the VHF and UHF bands are probably much greater than those experienced in the lower frequencies. At least this seems to be the case in the UK.

The need to occupy the 1.2-GHz band to ensure that it remains in the amateur service was a major motivating factor in recent applications for amateur-television repeaters in this band. Licenses were duly granted by the Department of Trade and Industry (the government department responsible for the Amateur Service) in early 1984.

These are the first such licenses to be issued in the UK and it is hoped that they will have a significant impact on amateur-television activities. By the time you read this, the initial five repeaters are expected to be operational. The callsign, location, and channel number of each is as follows: GB3GV (Leicester) and GB3UT (Bath): RMT1; GB3TV (Luton), GB3UD (Stoke-on-Trent), and GB3VR (Worthing): RMT2.

The frequency allocations (in Megahertz) for the two channels in use are as shown here:

	Vision in	Vision out
RMT1	1276.5	1311.5
RMT2	1249.0	1318.5
	Sound in	**Sound out**
RMT1	1282.5	1317.5
RMT2	1255.0	1324.5

The repeaters operating on channel RMT1 will receive both AM and FM signals but will reradiate in AM. Repeaters operating on RMT2 will receive and transmit in FM only (the sound frequencies shown are for AM; FM systems will utilize a 6-MHz sound subcarrier).

Vision signals are to be 625-line, negative-going with positive-going synchs. All FM signals are limited to a deviation of 6.5 MHz with CCIR pre-emphasis (and therefore similar to UK PAL broadcast standards). With horizontally-polarized antennas, repeaters will be activated by the presence of a valid video signal at the receiver input.

The British Amateur Television Club operates a recorded-announcement service giving details of all aspects of the club's television activities. From the US, this can be called on 44 (533) 600108. Please note that I am not a TV enthusiast and therefore cannot oblige with any more information if anyone is thinking of writing to me on the subject!

BARTG

1984 is the Silver Jubilee of the British Amateur Radio Teleprinter Group (BARTG) whose quarterly newsletter provides a wealth of information for RTTY enthusiasts (and those interested in FAX, AMTOR, and data transmission). Details of BARTG membership, publications (including *RTTY The Easy Way*), and products (including PCBs, etc.) can be obtained from John Breedie G6MOK, 161 Tudor Road, Hayes, Middlesex UB3 2QG, England. Please enclose an IRC or two for return postage.

BREAKTHROUGH

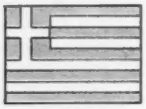
Following my previous comments on breakthrough in the 2-meter amateur band from the newly-legalized cable TV in the UK, it seems that problems may also occur with plans for Direct Broadcasting by Satellite (DBS). The BBC has been given government permission to begin transmitting DBS signals in 1985/86, and manufacturers already are looking at domestic receiving equipment requirements.

The European DBS bands will be around 11.7 GHz and designed for reception with a 1-meter-diameter dish. Such high frequencies require two i-fs, the first at the dish itself and the second on the set top. The equipment manufacturer's committee, BREMA (British Radio and Electrical Manufacturers Association), has selected initial intermediate frequencies around 1.2 GHz and 144 MHz. One can just imagine the problems for the average punter trying to receive very low level DBS signals in the presence of high-power amateur stations operating (quite legally) at the receiving system's i-fs.

These problems have been put to BREMA not only by the RSGB but also by the IBA (Independent Broadcasting Authority—the UK commercial TV operators) and the DTI (Department of Trade and Industry). Some sense has prevailed at 1.2 GHz at least, with a promise of a rethink. However, BREMA does not accept, per se,

a problem at 144 MHz and insists on more information before making any changes to its proposals. A working party has therefore been set up (typically British approach) to measure the levels of screening that can be achieved in practice and, presumably, therefore decide if breakthrough might occur.

Amateur signals are likely to be the only source of strong rf signals in the domestic environment, and it seems to me, and I suspect to the RSGB, that BREMA's attitude is somewhat negative. Rather than seeking to screen against signals that will be a problem, why not simply choose an intermediate frequency in another part of the spectrum where strong rf is not likely around the home? As if amateur stations do not have enough problems.



GREECE

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Athens 11210
Greece

Starting with this column, I would like to present to you some of the SV hams of whom you may have heard or even talked to on the bands. As I have already mentioned, DXing was something unknown a few years ago with the exception of one or two people, but over the last four years more and more new amateurs have joined a small team seriously involved with the HF bands. Nowadays there are more than 15 SV amateurs who are active almost daily.

So, I'm starting the presentation with Cliff SV1JG, who is likely to be one DXer well-known worldwide and probably the most active SV amateur during the last and the present year. You may also have heard him transmitting from Mt. Athos back in 1979 and 1980 and from SV5 and SV9 quite a few times during the last 5 years.

Cliff, who is now 32 years old, is living in Ekali, some 15 miles north of Athens, in a place which was chosen very carefully with antenna installation in mind! He has already 5-band DXCC, WAZ, WAC, and a very good score in phone and CW DXCC. He prefers to work SSB and CW, and in a few days he will try the challenge of a new mode (RTTY) with his Commodore 64 computer.

Of course, things were not so easy when Cliff started out. In 1978 he was using a TS-520 and dipoles on all bands and he managed to work more than 200 countries in less than a year and a half. Cliff also takes part in a lot of contests like the *CQ* Worldwide Contest, the WPX, the Scandinavian, the All Asian Contest, and many others. When 160 meters became available to Greek amateurs, he was one of the first to work there with a full-size inverted vee, with very good results. As he is able to transmit 300 PEP input (B class license), he gave a lot of people a new one on the top band.

Today, the station in SV1JG's QTH consists of a Yaesu FT-102 HF receiver, a Den-Tron MLA-2500 B amp, and a Heathkit® tuner. The antenna is a 4-element Cushcraft for 10-15-20 meters; dipoles and verticals are used on the low bands. For VHF and UHF, Cliff is using a Yaesu FT-480R and FT-780R, and the antennas are a 14-element KLM VHF and a 19-element F9FT UHF.

Cliff was at the Dayton Hamfest in 1981, and I hope that I will be able to join him for a planned trip in the near future.

HONG KONG

P. J. Weaver VS6CT
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91 Leighton Road
Hong Kong

Since the advent of the class B (no-code) license in Hong Kong, we now have over 100 enthusiastic VHF operators. A few are operating on six meters and one, VS6XLA, is now on satellite. The HF licensees don't seem to change too much; as fast as new arrivals get on the air, old ones leave. By the very nature of Hong Kong, we do get quite a few expatriates who come for two or more years only. HF licensees also number about 100, although there are very few active.

One of the major problems is finding suitable accommodation in Hong Kong, where high-rise apartment blocks proliferate, each building normally topped by a crown of thorns of TV antennas, each with its own broadbanded amplifier!

Socially, the locals and expatriates meet each Tuesday evening at the Cable & Wireless Sports Club, Caroline Hills Road, in the district of Causeway Bay on Hong Kong Island. This is very close to my home, and any visiting amateurs are welcome to visit me first (telephone 5-772313, between 5:30 and 6:30) before going on to the club.

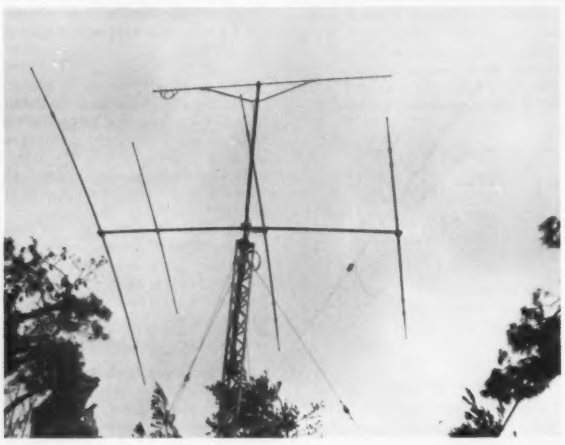
Visitors to Hong Kong who wish to operate can obtain a license to do so in 30 minutes upon application at the Post Office! All that is required is to show your original license and passport and have a photocopy of these for their files. In the event that you would be a resident for more than 90 days, then a full local VS6 license would be issued. These privileges are granted to all license holders from countries with which the United Kingdom has reciprocal agreement.

During the first week of February, I had the privilege of operating once more in Macao, and in four days of operating I made 3360 QSOs, all on sideband. With the help of my host, Jose Sousa (now XX9WW), we put up dipoles on 40 and 80 meters, and from the pileups on these bands there is plenty of scope for more operating from Macao! Look out for a Japanese DXpedition to Macao for August 10th to 20th approximately.

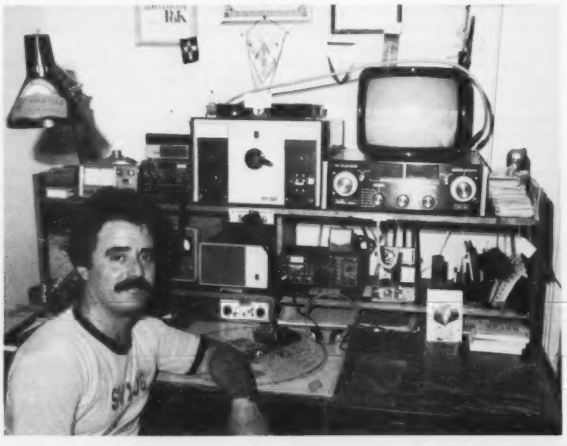
Interestingly enough, at this writing, nearly two months after the event, I have received only just over 700 QSLs. From this I am afraid that a lot of people will be sending their cards to a nonexistent QSL bureau. As is usual, they probably will end up in the Hong Kong Bureau. Although I am a member of HARTS, I can hardly inflict my outgoing CR9 cards on them. What it really amounts to is that education is needed by amateurs working DX-peditions. All have expenses such as transportation, hotels, QSL cards, and repairs to any equipment, in my case, to the borrowed linear.

So there are considerable outgoings which hopefully can be partly offset by incoming QSL cards with return envelopes and postage. Thanks to American amateurs who normally enclose a "green stamp" and Australians a "brown stamp," I shall just about break even, but what do I do with all those cards sent via the bureau? Two percent of the cards received direct have no envelope or return postage. I have actually spoken since to several of these latter stations, and without exception they have subsequently sent envelopes and postage. They had in every case just not thought about the problems at the other end.

I have, working as VS6CT over the last three years, made over 40,000 QSOs, and because of the problems with QSLing, established two QSL Managers—one in Japan (JA4ENL) and the other in England. If I had not done so, it would have brought into play the law of diminishing returns, for as the cards rolled in I would have spent less time on the air whilst filling them in. So what do you, the reader, want? If you want that VS6 or, for that matter, any rare card for your DXCC, please expect any rare DX station to have managers and always send a self-addressed enve-

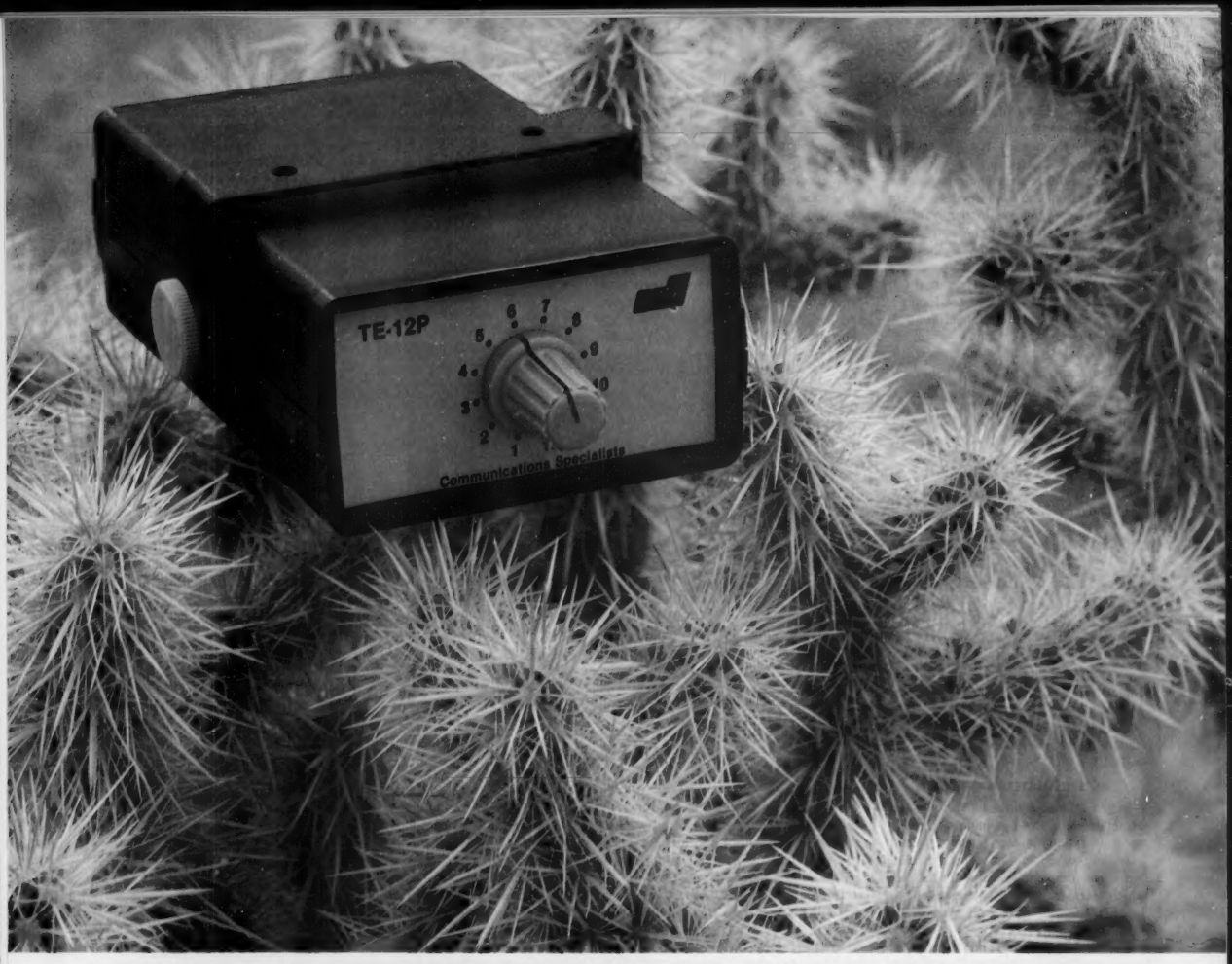


SV1JG's antennas.



Cliff SV1JG at his QTH.

Philip Weaver VS6CT.



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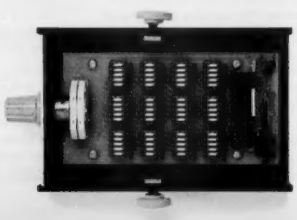

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77.0 XB	94.8 ZA	114.8 2A	141.3 4A	173.8 6A	
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lope with either 2 or 3 IRCs or a "green stamp."

One other aspect of operating from a fairly rare one is the different way one has to deal with the pileups. The Japanese are superb; you have to call only one or two letters or work by prefixes and all others keep quiet until you have worked that station; they seem to know instinctively that more people can and will be worked that way. When working Japanese by prefixes I have worked 5 a minute, but that's quite hard going. Europeans never seem to learn, and the only way I have found to work them is by call areas, but still you get the breakers: "QRZ," "how about 3," "what's your QSL information," etc., instead of spending five or ten minutes listening.

Americans now seem very happy to work the last letter of their call, which I believe was introduced by "Uncle Bill" W7PHO on the family hour. This works extremely well, and I have found a very satisfactory rate of QSOs achievable this way.

73 and good hunting.

INDIA

Jimmy H. Mistry VU2IJ
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Bandra, Bombay—400050
India

ACTIVE AMATEURS OF INDIA

Indian amateurs have been doing lots of active work, like providing emergency communication at Morvi where a dam gave way killing lots of people, helping every year the Himalayan motor-car rally which starts from New Delhi and goes up to 16,000 feet on the Himalayan Mountains, and providing the only line of communication in Gujarat and Andhra Pradesh which gets hit very often by cyclones and very heavy rains and floods.

After watching what the amateur-radio operators of India are doing for the public, our government started taking interest in our world-famous hobby and has taken a very bold step I think no government in this world ever has.

On March 17, 1984, when Indians celebrate the Holi Festival days by throwing different color dyes on each other, our government made amateur-radio operators' lives more colorful by waiving custom duty for wireless apparatus, accessories, and components, when imported by a licensed radio-amateur operator, up to a value limit of Rs.10,000 (US$1000) in a financial year, per license, subject to certain conditions. A red-letter day not only in the history of Indian amateurs but also for hams 'round the world.

We Indian hams do know that we are short of foreign exchange, but still our government values services given by us. I hope that all my brother and sister hams will keep up the good standard of hamming in India and will not act in any way which will make our government think of us in a different way next year when the new import policy is made.

Amateur radio is coming up very rapidly in India due to the hard work of our educational groups which are sparing no effort in running classes free of any charges for amateur radio. In India we have a science center in most of the states which have enough space and means to run such classes.

In Bombay we have the well-known Nehru Science Center which has run ham classes since April, 1978, and lots of students from local schools as well as working and elder people from all classes of life have taken advantage of it. One of them was Commander Mody who is 75 years old and has just gotten his license. The classes are held in Bombay twice a week, where I take Morse code and VU2MPN takes theory. It takes about 20 weeks to get one ready for a Grade 2 exam (which is a Novice exam) where the student has to copy Morse code at 5 wpm and have a little knowledge of electronics. Once the student gets his Grade 2 license, he goes on the air on CW on all the bands and gets some good hams who help him to increase his Morse speed up to 12 wpm. Then with a little more theory, he goes for his Grade 1 exam.

There are many active clubs in India that take keen interest in getting students ready for ham exams. To name a few: the Amateur Radio Society of India in Delhi, the Radio Electronic Society of India (Bombay), the Bangalore Amateur Radio Club, and the Andhra Pradesh Amateur Radio Society.

Indian hams are made up not only of OMs, but YLs and XYLs also. They are doing quite a lot of DXing and it brings a little QRM into the OM life as some OMs have to cook their own breakfasts when the XYL is having her sked with another OM; it's also interesting when an OM has a bedroom shack and has a QSO with some YL and has to answer a question like, "What is this woman doing on the air so late in the night?" Hi. The poor XYL may not be knowing that the YL with whom her OM is talking is far away in W-land and it is 0800 local time! Hi.

It would be a grand idea if the YLs/XYLs would start a "kitchen net" and start exchanging good recipes. After the net, the YL/XYL could run into the kitchen to try the new dish and the OM could operate on the band without any XYL QRM.

There are many XYL/OM teams coming up here and some of the famous are VU2FC/CP, VU2KT/WW, VU2GI/UGI, VU2NNN/NYL, VU2MY/MYL, VU2GDG/his XYL/his daughter, and VU2DVP/CVP. These are just a few, as every day new ones are coming up.

Now slowly our hams are getting maritime mobile licenses, and there are a few operating from ships: VU2KZ, VU2UDD, VU2HSL, VU2LNN, and VU2FMB, and it is fun talking to our own boys from DX land.

There are very few hams on RTTY—at the moment, just two: VU2VIM (OM Vimal) and myself. Now that the import is allowed, we may find more hams coming up on this mode.

On OSCAR there is some work done by one, VU2RM, and he put India on the map of satellite communication. I was also doing my best as AMSAT area coordinator, but we are not able to work OSCAR 10 as we are not allowed to transmit on 70 cm, but we are now awaiting the license and I am sure very soon Indian hams will be on OSCAR 10.

Last but not least, the permission to operate the VU7 from Lakshdeep came as a surprise to all the hams over the world, and three groups operated for 15 days at a time. The last group led by VU2GDG did a wonderful job and I think now hams 'round the world have worked VU7 on all the five bands.

I am sure with all the encouragement given by our government now, India will not be a rare station in the world and there will not be more complaints that Indian hams are bad QSLers as now we have another QSL bureau which is run by me on behalf of the Federation of Amateur Radio Societies of India via Post Box 6538, Bombay 400026, India. This bureau is giving service to each and every ham 'round the world free of any charges. All expenses for running the bureau have been covered by the Federation for the last 15 years. I am real happy when I hear that now hams all over are having no problems in getting Indian QSLs; it gives me real pleasure that my work for the last 15 years was useful to everybody. I am very thankful my Federation has given me cooperation in running the bureau.

ISRAEL

Ron Gang 4Z4MK
Kibbutz Urim
Negev Mobile Post Office 85530
Israel

THE ASERET HAMFEST

For the past 35 years of its history, the Israel Amateur Radio Club has held only one national get-together a year—the annual general membership assembly of the association. Israeli law stipulates that all registered nonprofit organizations must have one such meeting a year to elect officers, and the declared purpose of the IARC annual assembly was to fulfill the letter of the law.

Over the years, our national association has grown from a handful of hams to over 700 members. In fact, the yearly meeting grew into a full-fledged convention squashed into one evening. It was no secret that most hams came primarily for the social get-together and the raffle of donated equipment, with the running of our organization being only an afterthought.

Last year it was decided to delete the raffle in order to give more time to the open "political" discussion and election of the executive. Needless to say, attendance dropped, and a past treasurer protested that the club's coffers had lost important revenue. The special-events committee met, and it was decided to try something new—a totally social event, a hamfest devoid of club politics, devoted entirely to enjoyment!

Thus, on Tuesday evening, March 27th, we gathered together at the community center of Aseret, a rural community half-an-hour's drive south from Tel Aviv. Amateurs came from as far away as Eilat on the Red Sea and the northern Galilee. There were visitors from the States, and the most exotic DX was a couple from the Philippines! For us all it was a great opportunity to make eyeball contact with those who up till then had been only voices coming forth from the loudspeaker.

Here in Israel no event is complete without opening speeches, but thankfully they were short and to the point. Aharon 4X4AT, IARC president, opened the program and thanked the various firms and individuals who donated prizes for the draw. 4X4GE of Motorola announced that his company was giving us space in one of their sites for our two-meter RTTY repeater. And the chief officer of the Israel Defense Forces' Signal Corps praised the technical perfectionism of the radio amateurs and hinted that surplus gear would continue to come our way.

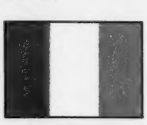
A fine and ample buffet, prepared by some of the amateurs and members of their families, ensured that no one went hungry and left early in search of a restaurant. Indeed, of all the IARC affairs I ever attended, this one had the best food! A program of entertainment with audience participation took place, although your scribe must confess that he took advantage of this time to meet with more hams.

The closing event was the long-awaited raffle. During the course of the evening, several volunteers had been going around hawking tickets at the shekel equivalent of a dollar fifty each. Our treasurer announced that we were now approximately two thousand dollars richer (or poorer, depending on how you look at it).

Prizes ranged from swr and power meters, mobile antennas, surplus "junk," and test equipment to a brand-new Lynx personal computer. There also were packages of cosmetics and artistic items for the ladies, and one gaudy statuette of a mermaid which was dubbed by Yankele 4X4AH, presiding over the draw, as an original microphone stand! Tickets continued to be pulled out of the bin, and a few "winners" failed to come forward to claim their boat-anchor Motorola D43GGV VHF transceivers which less than a decade ago were the mainstay of two meters in Israel.

The tension rose to its peak as the winning ticket was drawn for the microcomputer. I later learned that our lucky winner had bought no fewer than twenty-five tickets and had picked up a few other prizes in the process!

After saying good night to each other and thanking the organizers of the evening, we headed for the parking lot and began making our way back to our respective locations. No doubt, the Aseret hamfest had been an overwhelming success. Virtually all agreed that there's no need to wait a whole year before doing it again. Now, what remains to be seen, after all this, is what will be the nature of the upcoming general assembly of the IARC membership!



ITALY

Giancarlo Martelli I0XXR
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00162 Rome
Italy

One of the most enchanting tourist resorts in Sicily, the small town of Cefalu located near Palermo, hosted this year, April 8-13, the International Amateur Radio Region I Conference.

The honorary and practical task of organizing the event was undertaken by Associazione Radioamatori Italiani (ARI), and many important administrative and government agencies, recognizing the importance of amateur radio, gave their effective aid. Among them were the Sicily regional government, the official tourist agencies of Palermo, Trapani, Cefalu, Termini Imeresa, and Castelvetrano, and the Bank of Sicily and Fiat.

The special prefix IT84 was issued to all Sicilian ham stations, and during the conference the ARI official station worked from Cefalu with the call IP9IARU.

The meetings were held at the Hotel Club Costa Verde, a big and futuristic holiday center which hosted also the delegates of the Region I associations and all the guests attending the conference.

It is very important to note that such an important conference took place in Italy, a country where amateur radio recently suffered heavy attacks, as the readers already know. ARI and the associated groups promoted widespread publicity (state television, RAI, transmitted a spot on the event in the Telegiornale, the most popular news transmission) and obtained attendance by the Republic President,

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Pertini, and by the Ministero Poste e Telecomunicazioni (MPT), the very same telecommunications administration which had been accused of being an enemy of amateur radio!

Moreover, the highest officials of the MPT, in the persons of the General Manager, Dr. Monaco, and the Central Director of the Radio Services, Dr. D'Amore, attended the opening and declared officially the Italian government's goodwill toward the Amateur Radio Service.

At the conference was an important group of observers including the IARU president, W1RU, the ARRL president, W4RA, and the JARL president and secretary who represented IARU Region 3. For the first time in amateur-radio history, three European Ministries of Telecommunications, West Germany, the Netherlands, and Italy, had their technical observers officially attending the conference.

All this represents a further step ahead in the campaign of the amateur community to support the IARU with the primary intent of promoting our activities and defending our interests against the increasing appetites of other services. The presence of three official state observers, moreover, is evidence of an increased concern of the states as far as the cultural, technical, and social importance of our service is concerned.

Beyond the technical conclusions of the conference, it is paramount to underline the political importance of the above-noted presences of officials. It means that radio amateurs have obtained respectability and fair contractual power for discussing problems and needs and sustaining their rights and privileges. This power shall be enhanced with the good behavior of every one of us, operating our own radios, working for technical progress and for the social welfare, and supporting our associations. In fact, "association" means union of efforts and thus means power.

At the conference were present 32 associations—Algeria, Andorra, Austria, Belgium, Czechoslovakia, Denmark, Finland, France, West Germany, East Germany, Jordan, United Kingdom, Ireland, Israel, Italy, Liberia, Luxemburg, Malta, Monaco, Nigeria, Norway, the Netherlands, Oman, Poland, S. Marino, Sierra Leone, Spain, South Africa, Sweden, Switzerland, Hungary, and the USSR. Bahrain, Zimbabwe, and Djibouti sent proxies.

The technical work was carried out by three committees, A, B, and C, which issued at the end their recommendations, which will become official law for the self-governing amateurs in the IARU Region 1. Arguments with these recommendations are many, and I will try to recall only some of them.

Among the most important are the international beacon project, radio direction-finding activity, the promotion of amateur radio in developing countries, a common license project, piracy on amateur bands, standardizing of QSL cards, special call-signs and recommendation to limit their use, RTTY, AMTOR, and ASCII, bandplans, satellites, and 432-MHz repeaters' standard frequencies.

At the time of writing these lines, the situation hasn't changed much recently. The MPT has released the 160-meter band from 1.830 to 1.850 kHz (100 W out maximum) and the two higher new WARC bands and has given authorization to use 10 Watts on 144 MHz and up for mobile use. No resolution yet of the other controversial points: 3.5-MHz band, 10-MHz band, and the repeaters. Although the Post and Telecommunications Ministry has clearly demonstrated a much softer position toward amateurs' problems, it seems at present to be unable to move further. Bureaucratic obstacles seem to be stronger than the political will. It should also be considered that when the old law ruling radio amateurs was issued, that law ruled tightly many technical areas which, when updated, become quickly "illegal." So, as a law can be modified only by another law and due to the fact that in Italy a law often takes twenty or thirty years to be issued, the MPT is faced with the problem of satisfying the needs of amateurs by twisting amendments between the law lines.

In particular, as far as the repeater operation is concerned, the MPT understands that it is foolish to forbid a kind of operation which is of paramount importance in case of emergency, but bureaucracy says that any kind of repeater should pay a considerable annual tax (as a substitute for a land line); the tax amounts to some thousands of bucks per year—well beyond the ham's possibilities.

On the 3.5-MHz band problem, it appears clear that the MPT has already assigned parts and channels to other government agencies and seems unable to cancel these allocations without losing face; it offers to amateurs only 100 kHz. The amateurs oppose that mutilation of a band assigned to their service by ITU. On the same principles, the MPT offers amateurs only 10 kHz of the new 10-MHz WARC band, stating that on that band our service is only secondary and that in any case they should have the OK from the Defense Ministry. This reinforces the opinion that in the period when amateurs were neglected, the MPT let the military take the lion's part on this band and now they are unable to turn back.

Some conference observers: from the right, the JARL president, the ARRL president, the secretary, Region 2 (Colombia), the JARL secretary, and the ARI president.

LIBERIA

Brother Donard Steffes, C.S.C.
EL2AL/WB8HFY
Brothers of the Holy Cross
St. Patrick High School
PO Box 1005
Monrovia
Republic of Liberia

Two hundred twenty-five inches of rain! That is a lot of rain for one year.

It does not rain in January or February, but it gets very hot and then there is the Harmatan. The Harmatan is an atmosphere of fine dust that blows across Liberia from the Sahara Desert. It clouds the sky to an altitude of over forty thousand feet, and here on Earth it covers everything inside the house and out. I draped a heavy cloth over my radio equipment, but it did not escape. The dust did its job. It got into everything.

Here along the ocean (Monrovia is situated right on the shore of the Atlantic), we have salt spray all the time, but during the Harmatan season, the salt spray mixes with the dust and makes a grimy coating that covers all antennas, ground lines, coax cables, and anything else that is exposed to the outside air. When you turn on your radio, you find that the swr is up and the line noises are at a level that will curl your hair. I have a fourteen-thousand-volt power line passing about a hundred yards behind my TA-33 when it is pointed toward the States. The line noises go up to S8 and S9. I am not completely sure whether the blame should go to the salt spray-Harmatan combination or to the power line. Chances are that it is a combination of both. In any case, I do know that in March, when the rains begin, the frying, crackling noises go to zero.

Here in this part of Liberia we are dependent on hydroelectric generators for a great part of our power. As the dry season gets under way, the first thing we know the gates have to be closed to conserve water for the city supply; then the electrical power has to be rationed. We can use candles for light, but they will not power the radio, so we grief-stricken amateurs have another headache. A few of the stations operate on battery power, but that is another area that has its troubles.

The ionosphere has to get into the act, too. At least so it seems. During February I missed all my schedules. When there *was* power, the bands were so dead that one was lucky if he heard even one Brazilian station. Brazil has a direct line into West Africa. They are always there with signal strength that can override anything. Once in a while a station from England or Sweden will squeak through, but the United States might just as well not exist. I seldom operate at night, which here in Liberia would mean after seventeen or eighteen hundred Zulu. It may be that the night people working twenty meters fare better. Really, I don't think they fare much better.

Sometimes we get one or two heavy rains in March. The antennas get washed, the air becomes clear (one can actually see the shape of the sun), and if the ionosphere is there, the radio comes to life and one can communicate. In March, however, the respite is brief. The month is dry for the most part. In April it rains a little more. There will be an average accumulation of eleven inches. The electric company turns on one of its turbines and the antennas stay clean a bit longer. In May it gets down to serious raining and will run an average of twenty-five inches.

Please understand that all this is happening in Monrovia. Twenty-five miles out of the city in any direction, or even less than that, this whole situation would change. There would be no salt spray, the rainfall could be drastically different, and there might be no electric power at all.

In the data that I have gathered over a bit more than three years, June takes the cake. My records show an average of fifty inches for the month of June! July, August, and September will run about thirty inches each, and then the rains drop off with October (twenty inches) and September (fifteen). December is dry. It might accidentally rain in December, but it must be listed as a dry month.

I have found it very interesting to observe these happenings. While this can in no way pretend to be scientific, it has been fun to compile data, make charts, and compare records. I have no notable observations concerning radio communication during the times that the rains are very heavy. It is true that there are frequent periods of clear air and sunshine. It seldom rains continuously for more than a day. For the most part, radio communication is good and the amateurs walk around with smiles on their faces. Even people who are not amateurs smile. They like the rainy season, too. It is cooler.

NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

SOUTHLAND FLOOD DISASTER

January in ZL-land is the middle of summer. Wednesday, January 25, was a fine hot day in Invercargill, the southernmost city in New Zealand, and all was well in the first week back at work after the summer holidays. The rain started at midnight, and on Thursday morning it was still raining. Nothing very unusual about that.

What was unusual was that the rain was to continue without slackening throughout the day. By 2100 hours NZST Thursday night, the Fire Service was involved in pumping water from flooded buildings and streets were being closed because of rising water levels, but so far the creeks and rivers were still within their banks. The flooding at that time was caused by an overloaded stormwater system. At 2315 it was still raining, and it seemed likely that those involved with Invercargill's Emergency Services would not get a full night's sleep.

At about 0315 hours, Friday the 27th, the AREC (Amateur Radio Emergency Corps) and Civil Defense Communications Leader, Neville Checketts ZL4OX, was summoned to CD HQ because a dec-

Continued on page 106

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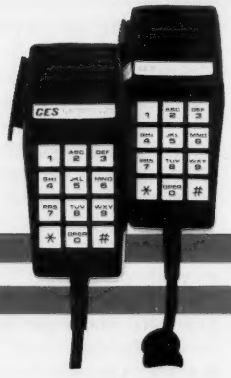

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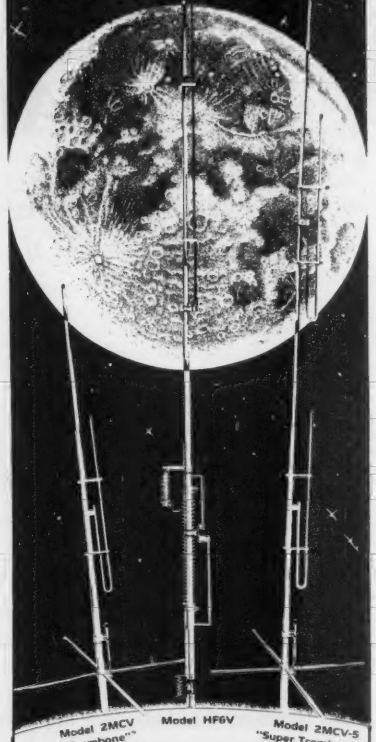

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AMTOR How-To

FEC? ARQ? Don't panic. Timely advice from the father of AMTOR takes the confusion out of our newest mode.

The following text is from a letter to W2JUP from Peter Martinez G3PLX, dated 9/24/83, on the subject of AMTOR operating practices. This information is reproduced by express permission of the author and is offered as a guide to AMTOR operating rules, as suggested by the one man most responsible for bringing AMTOR into the amateur-radio fraternity. Newcomers to the AMTOR mode are invited to give serious consideration to the ideas presented here and to add these sections to whatever AMTOR equipment operating manuals they may have.

Here are some thoughts on the subject of operating rules, etc., for AMTOR. They are in no particular order and are written down exactly as they occurred to me as I sat in front of the typewriter. They represent aspects of AMTOR operating that have given rise to problems so far over here and some (the hot QSY technique) which have been invented to complement the advantages of AMTOR.

1. Legalities

Establish before operating whether you are authorized to do so. Most countries where there is currently AMTOR activity permit it by general license regulations. Some countries require the licensee to apply for a special permit. Some countries do not permit AMTOR. In others, stations are active.

2. Getting Started

The most popular AMTOR mode is ARQ, since it is the most effective. However, do not attempt to make the first QSOs on ARQ until FEC has been tested and is known to be working. If there is a fault in part of the system, no contact will result on ARQ at all, whereas at least if one direction (transmit or receive) is working, faults can be identified and cured with contact in FEC. The following step-by-step procedure will assist in finding faults during commission of a new AMTOR station.

2.1. Check FEC receive first, with a known distant station sending in the correct shift-polarity. This will confirm that the station receiver is working and in the correct shift-polarity.

2.2. Check FEC transmit next, asking a distant receiving station to confirm that the transmit shift-polarity is correct.

2.3. Make a short transmission with an ARQ call, asking the distant station to use "listen" or "monitor" mode to check that the transmitter keying is functioning correctly. The most common fault at this stage is a too-slow changeover from receive to transmit, resulting in missing transmitted data at the start of the burst. Some AMTOR units have a delay adjust which may allow slow transmitters to be used successfully except for very long distance contacts. Some remedial work may be required on the radio if this test fails.

2.4. If 2.3 is successful, ask the distant station to make an ARQ call to your selcal. Your station should respond and an ARQ contact should result.

2.5. Finally, make an ARQ call to the distant station and attempt an ARQ contact with your station as master rather than, as in 2.1, as a slave.

If no contact results yet the distant station indicates that he was replying to the call, then the problem is that the radio is too slow to change from transmit to receive. Remedial work may be required to correct this. No adjustment to the "delay" preset in the AMTOR unit, if fitted, will cure this problem. Consult the supplier of your radio if remedial work is needed. It is important to follow these steps in order. Unnecessary confusion, frustration, and interference can result from a premature attempt to start an ARQ contact where the complete contact cannot be made until all the component parts are working correctly.

3. Operating Techniques

AMTOR is sufficiently different from other modes that some of the operating practices traditionally used on the air are no longer appropriate, and some new techniques peculiar to AMTOR need explaining.

3.1. FEC and ARQ. When to use them. ARQ is well known to be the better of the two, but there are several situations where FEC has its advantages and some where its use is essential.

3.1.1. Use ARQ for all two-way contacts.

3.1.2. Use FEC for all multi-way contacts.

3.1.3. Do not use ARQ for CQ calls. There are several reasons for this:

3.1.3.1. Listeners cannot identify the calling station in an ARQ CQ call. Thus, they either must risk replying to a station with whom contact was not desirable or suffer the embarrassment of having to terminate a contact if, for example, it turns out to

be the station you have just worked.

3.1.3.2. If a contact which resulted from a CQ call on ARQ subsequently runs into a rephrase attempt, the resultant CQ call from the master station may attract a completely new reply from a third station, thus resulting in this new station "stealing" the contact.

3.1.4. FEC will have to be used if the distance between the two stations is longer than about 22,000 miles, such as in "long-path" contacts which travel more than halfway round the globe or some high-orbit satellite contacts. Make sure you know in advance if the path you are attempting is in this category, and do not attempt ARQ under these conditions; it is very frustrating to be called on ARQ when it is known that the path is too long and very difficult to attract the attention of the caller to the problem.

3.2. Starting an AMTOR QSO.

There is no need to explain how to start an FEC QSO since the technique is identical to that of other modes. However, since in ARQ mode it is necessary to know the other station's selcal code before calling him, a new technique must sometimes be required.

3.2.1. If the other station's selcal code is already known, as in the case of a "sked," then there is no problem. Simply enter the required selcal code to the AMTOR unit, and if/when the desired station is on frequency, he will reply and the contact can proceed.

3.2.2. If tail-ending on a previous contact and the intention is to call one station on ARQ and his selcal code is not known, then there are two ways to proceed:

3.2.2.1. There is a convention in operating amongst AMTOR operators with respect to the way to choose the station selcal code from the station callsign. This is to choose the first letter of the callsign followed by the last three letters, ignoring completely any figures. In the case of a callsign with only three letters altogether, the first letter is repeated twice. This ruse breaks down for callsigns in which the prefix contains figures. However, if the callsign of the desired station can be translated into a selcal code in this way, then use the selcal code to call him after he signs off with the station he is working.

3.2.2.2. If his callsign cannot be encoded in the above way or his callsign is now known or he does not respond to the expected selcal code, then call him in FEC mode, giving him the choice of calling you back on your selcal code or asking him to tell you what selcal code he is using. Note that some stations who may be using commercial SITOR-type units may not always be able to make ARQ calls to all possible combinations of letters in a selcal and thus may require that you call them, often with a selcal code that bears no relationship to their callsign, being in fact a translation from a telex number associated with the commercial equipment.

3.2.3. To make a CQ call to start an AMTOR QSO, do so on FEC mode, mentioning your own selcal code so that at the end of your call, a prospective QSO partner can call you back directly with your selcal. If you are expecting replies only on FEC (for example, for contacts via a long path), mention this fact in the CQ call.

3.3. Operating techniques whilst in contact in FEC.

Whilst operation in FEC is very similar indeed to that of conventional RTTY, there are two points to note, however, both related to the method by which the FEC receiver synchronizes the distant transmitter:

3.3.1. Since the receiver can only synchronize to the transmitter when it is not sending traffic (that is, idling), each transmission must start with a period of idling. Most AMTOR units will ensure that a short period of idle precedes the typed message, but under poor conditions or where it may help the distant receiving station to tune in, extra periods of idle will help, both at the beginning of the transmission and also at periods during the transmission, in case interference may have resulted in the distant receiver losing synchronization.

Note that the practice common on conventional RTTY of transmitting a line of test message or RYRYRY to allow the distant station to tune in is actually counterproductive on FEC, since the distant receiver will not synchronize until the end of this test sequence and the idle signal itself is quite suitable for tuning purposes.

3.3.2. Some commercial SITOR-type units require a received FEC transmission to start with a carriage return and/or a line-feed signal. For this reason, and also to aid the formatting of any distant printer copy, always start an FEC transmission on a new line.

3.4. Operating techniques on ARQ mode.

3.4.1. Transmitter and receiver tuning.

An ARQ contact always starts with the master station making the initial call and the slave replying. Thus the frequency will have been chosen by the master station, and the slave station will have "netted" onto that. It often happens that an offset at either station will then result in the signal from the slave received at the master being a bit off tune. If the master station then readjusts his transceiver's main tuning dial to remedy this error, he will also offset his transmitter, probably putting his signal off tune in the distant slave's receiver. A never-ending series of readjustments can then take place.

The equivalent problem on other modes rarely causes trouble since the retune operations only take place each time the transmission is passed from one station to the other. However, with the "quick-break" operation of ARQ, such offsets can cause trouble. Thus a convention has been adopted among AMTOR operators to prevent this situation arising. This convention is that the master station must at all times keep his transmitter frequency constant. Thus if the master finds that the slave signal is not correctly tuned, he must adjust only his receiver frequency to remove the error, leaving his transmitter frequency untouched, by the use of the RIT control on the transceiver. The slave station, on the other hand, may, if he finds his receiver off tune, make a correction by adjusting both receiver and transmitter frequencies together by means of the main tuning dial. This convention prevents any offset from accumulating and is the frequency-domain analogue to the time-domain synchronization in which the master-station clock determines the phasing for the contact.

3.4.2. Changing frequency during an ARQ QSO.

Since both stations are "listening through," if there is some interference on the frequency or if a change of frequency is desirable for some other reason (for example, to clear a calling frequency), then both stations may wish to move together to another frequency. Whilst at first there may seem to be no reason to discuss such a simple operation, which is very common and easy to perform on any other mode, there are problems if a QSY is made in some ways in ARQ, and there are advantages in adopting a specific technique.

3.4.2.1. The easiest way of QSYing an ARQ QSO is to close down and restart it again on a new frequency, with the master station choosing the new frequency. This is referred to in AMTOR circles as a "cold" QSY. This technique is the preferred one when moving off a calling frequency and in other conditions where there is good copy between stations, so that an orderly close-down and start-up is anticipated.

3.4.2.2. If, however, the QSY is desired because of interference, then another technique is possible; if carried out in the right way, it can have decided advantages, but if carried out wrongly, it can cause problems and offense to other band users. This is referred to as the "hot" QSY technique.

In this, the master station, while in the rephasing mode, moves off the old frequency to the new one, and the slave then follows.

It is important, while the master station is doing this, for him to prevent his transmitter from radiating in order to prevent unintentional interference to other band users and also to disable the connection between the receiver and the AMTOR (in order to prevent unintentional "phantom sync" to any other ARQ signals which may be audible during the search for a new frequency). Such phantom sync will result in spillage of traffic from the QSO in progress, from the other QSO, or both. It can only be the master station that leads in a hot QSY. If the slave station were to attempt to lead a QSY, then, in the event that it was not successfully completed before the contact timed-out into a rephase operation, the slave would no longer be transmitting, and there would be no way for the slave to establish a new frequency without restarting as a master and thus losing some traffic.

3.4.3. Fixed-channel working.

Since it is possible to leave an AMTOR station in "standby" mode on a channel and for any other station to make a specific call to that station, a common practice in AMTOR is to monitor such a specific frequency. The question arises as to what exactly is the "frequency" of an AMTOR emission. There are, unfortunately, two different conventions in use; one more commonly used in amateur circles, and the other used universally by all non-amateur users.

3.4.3.1. The "amateur" convention says that an AMTOR signal (and indeed any FSK signal) is specified with reference to the frequency of the higher frequency tone in the pair. Thus, if a sked, for example, is prearranged to occur on 14,075 kHz, this is taken to mean that the two transmitted tones are on 14,075.00 and 14,074.83 kHz.

3.4.3.2. The "commercial" convention, also used increasingly by amateurs, says that the signal is specified with respect to the frequency of the imaginary center channel. Thus a signal said to be on 21,100 kHz will have one tone on 21,099.915 kHz and the other on 21,100.085 kHz, that is, 85 Hz either side of the nominal, rather than with one tone on and the other tone 170 Hz below the nominal. Note that it is assumed that the frequency shift is universally accepted to be 170 Hz.

Thus, in any specification of a "frequency" in connection with AMTOR working, due regard must be taken of the convention intended, at least until such time as one of these conventions is dropped in favor of the other.

Another factor is significant with respect to setting frequencies on the dials of SSB transceivers used on AMTOR with audio-freqency shift tones used. Since the tones will result in transmissions offset from the suppressed carrier frequency, the dial, which normally indicates the suppressed carrier frequency, will not read correctly. It will be necessary to add or subtract a fixed amount to the dial frequency in order to establish the actual frequency in use. For example, if the transceiver is in use on lower sideband, with audio-tone frequencies of 2125 and 2295 Hz, then, to operate on an "amateur" frequency of 14,075, the transceiver dial must be set to 14,077.125, that is, 2.125 kHz higher than the desired freqency. The two radiated tones will then be on 14,077.125 − 2.125 (14,075) and 14,077.125 − 2.295 (14,074.83). Other offsets must be used if a "commercial" channel is to be set up (2.210 kHz), and the offset will be in the other direction if upper sideband is to be used in the transceiver. The offset must be recalculated if the tone frequencies are different from those quoted.

Users of transceivers with an FSK connection must consult the transceiver handbook or supplier to establish if an offset has to be applied to the dial frequency. Even if the transceiver supplier indicates that no offset is needed, it will be necessary to establish if the "amateur" or "commercial" convention is implied or some other convention.

3.4.4. Use of the "over" or "break-in" facility.

In ARQ mode, it is possible, by use of the "over" or "break-in" facility, to interrupt the sending of the other station. This facility should be used with care and only in situations where it is essential to do so. The reason is that there are inherent reasons why recovery from such an interruption can result in garbled copy at one end of the contact, in particular in "figs" garble. If possible, wait until the other station is idling before breaking in, and if the other station breaks into your transmission, it will probably help to use the "clear buffer" facility, if such exists, to abort the later transmission of any unsent text which would be inappropriate to the new context of the break-in.

3.4.5. The AMTOR alphabet, like the RTTY alphabet, consists of two sets of 30 characters, with a switch made between them by two "shift" or "case" codes. One inherent result of this technique is that it is often not known which shift the distant receiving station is in at the commencement of the contact. For this reason, it is always good practice to send the appropriate shift code at the start of each contact, and indeed, at the start of each message and perhaps at more frequent intervals. With terminals encoded in teleprinter code, there are always two keys, labeled "letter" and "figures," and so it is simply necessary to hit the appropriate one of these keys as required.

However, on more modern terminals, these two keys may not exist, and the sending of the shift code may be hidden from the user. However, since the distant terminal could still nevertheless be in the wrong shift, there will always be the requirement to send the shift code at the start to prevent the distant receiver copying the first part of the text in the wrong shift. Consult the documentation with your AMTOR unit or terminal in order to establish how to do this if there is no "letters" or "figures" key.

4. Format of Selcal Code

Although the convention is to form the selcal from the callsign, some AMTOR units have the possibility to include any AMTOR character in the selcal. It is strongly recommended, however, that only the 26 letters A–Z are used in selcal codes. ■

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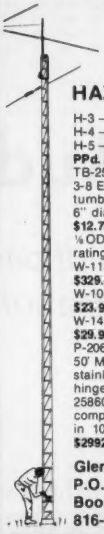

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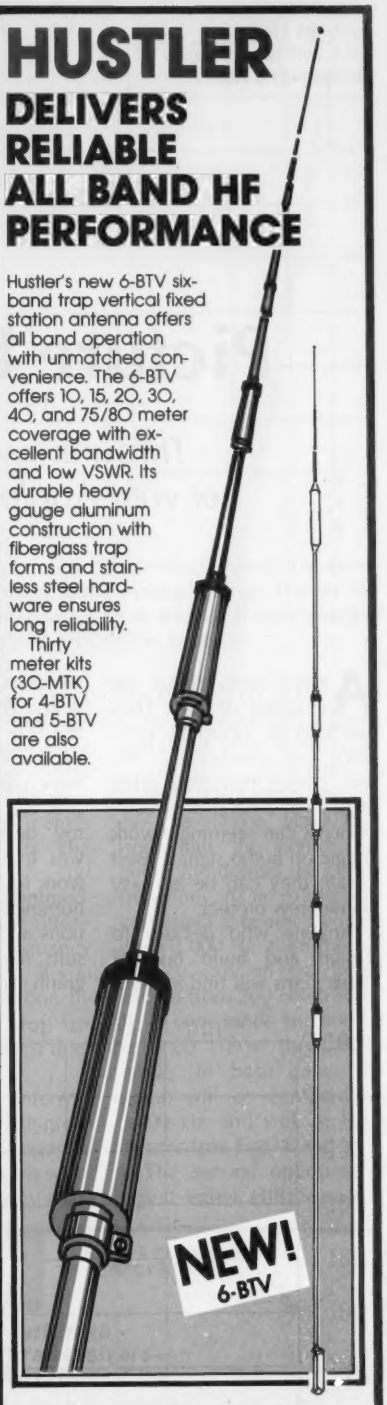

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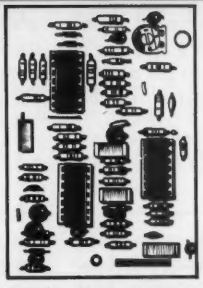

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Picture-Perfect Audio Filters

Throw away that antique breadboard and scope.
Let your Apple II peak and tweak a soft circuit instead.

Active audio filters are amazing devices. They seem to be incredibly powerful yet wonderfully simple. I have marveled often at the way a handful of components can seemingly work magic on audio signals. Best of all, they can be an easy home-brew project.

Anyone who decides to design and build one of these gems will find a major stumbling block, however. It is very difficult to determine the true frequency response of the filters. In the past, I have used two methods to plot the response curve for my designs. One method was to use a calculator to work my way through some horrendous transfer functions and then graph the results. In order to get a useful graph, you must do the calculations for twenty or thirty frequency values. This method is an excellent way to wipe out several evenings or a weekend.

A second method is to breadboard the design and then go to work with a signal generator, oscilloscope, and graph paper. While this method is less tedious, it has many of its own problems, such as the accuracy of the test equipment and components used in the circuit. Now there is a third alternative for finding the frequency response of active filters. If you have access to an Apple II computer, you can use the program described in this article.

The program I wrote generates a graph of the frequency response of your own custom filter designs.

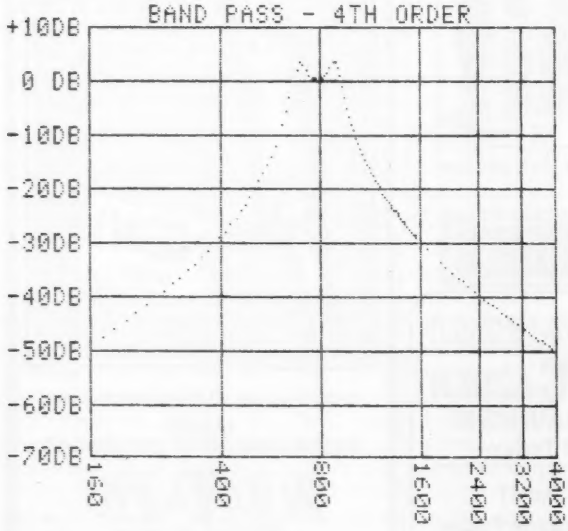

Fig. 1. Typical curve generated by the program. This is a two-section bandpass filter. The graph center frequency is 800 Hz and this was plotted in the wide mode.

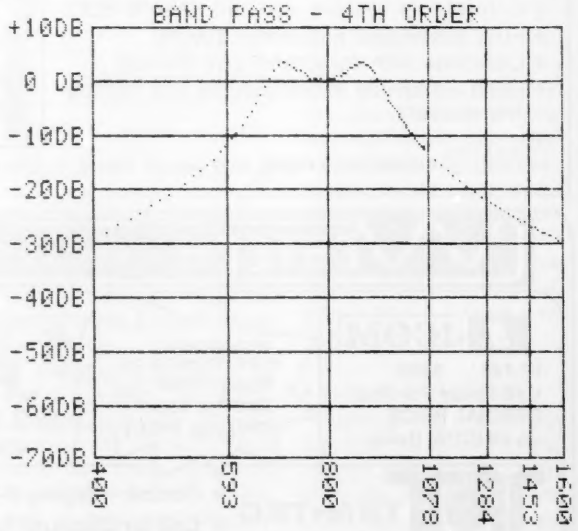

Fig. 2. The same graph as Fig. 1 but plotted in the narrow mode so that the central area can be examined. Note the horizontal frequency scale as compared to Fig. 1.

```
]     00 01 EF D8 00
*6000.6307

6000- 38 00 92 00 94 00 9B 00
6008- A3 00 B5 00 C5 00 D2 00
6010- E3 00 EB 00 F5 00 FF 00
6018- 0A 01 12 01 16 01 1B 01
6020- 1E 01 27 01 36 01 3E 01
6028- 4B 01 58 01 63 01 73 01
6030- 82 01 8E 01 9B 01 A6 01
6038- A9 01 AD 01 B8 01 C0 01
6040- C8 01 D5 01 E5 01 F2 01
6048- FE 01 0B 02 17 02 23 02
6050- 2F 02 3C 02 49 02 52 02
6058- 5C 02 6B 02 75 02 81 02
6060- 8F 02 9E 02 A9 02 B6 02
6068- C4 02 D2 02 DA 02 E8 02
6070- F7 02 03 03 00 00 00 00
6078- 00 00 00 00 00 00 00 00
6080- 00 00 00 00 00 00 00 00
6088- 00 00 00 00 00 00 00 00
6090- 00 00 00 00 08 18 30 36
6098- B6 04 00 08 18 18 36 0D
60A0- 24 04 00 08 18 18 36 36
60A8- 36 0D 24 24 24 95 1F 1F
60B0- 16 0D 0D 04 00 09 08 18
60B8- 3F BF 0E 2D D5 F1 3F 77
60C0- 21 20 20 20 00 08 18 18
60C8- 37 6D F1 1E 1E 1E 4D 35
60D0- 27 00 B9 16 0F 18 0F 18
60D8- 0F 18 0F 18 64 15 B6 1B
60E0- 76 25 00 09 18 08 18 1E
60E8- 1E 04 00 64 0C 96 92 0F
60F0- 18 0F 18 04 00 E4 1C 96
60F8- 92 0D 18 0D 18 04 00 24
6100- 95 0D 18 16 1F FE 20 A8
6108- 04 00 24 96 6E 08 18 FF
6110- 27 00 32 1E 04 00 2B 2D
6118- DF 23 00 92 04 00 08 18
6120- 48 F6 1E 1E 1E 26 00 0C
6128- 0C 1C 3F 17 36 2E 1E 0E
6130- 2D 0D 18 24 24 00 18 60
6138- 36 36 AE 3F 04 00 08 D8
6140- 63 2D 15 F6 1E 1E 1E 2D
6148- 2D 04 00 0C D8 63 2D 15
6150- F6 0E F6 3F 0F 18 04 00
6158- 4A D6 24 24 24 1E 1E 1E
6160- 2E 25 00 09 08 18 38 3F
6168- 37 2E 2D 15 36 1E 3F 0F
6170- 18 04 00 09 08 18 18 BF

6178- 1E 2E 2D 15 F6 3F 0F 18
6180- 24 00 1B 08 18 2C 2D 35
6188- 1E 1E 1E 1E 26 00 3F 20
6190- 0C 2D 15 F6 0E F6 3F 0F
6198- 18 24 00 39 3F 20 0C 2D
61A0- 15 36 F6 1E 27 00 B0 04
61A8- 00 B0 1E 04 00 09 08 18
61B0- B8 17 17 0E 0E 0E 04 00
61B8- 1B 28 2D B5 3F 3F 04 00
61C0- 1B 08 1B 70 0E 0E 1E 1E
61C8- 1E 04 00 08 D8 63 2D 15
61D0- F6 1E 16 04 00 52 09 18
61D8- 24 E4 3F 17 36 36 0E 2D
61E0- E5 38 24 25 00 2D 36 FE
61E8- 1B 24 2C 1C 0C 0C 15 15
61F0- 04 00 3F 24 2C 2D 15 F6
61F8- 0E F6 3F 27 24 00 08 58
6200- E1 3F 17 36 36 0E 2D 0D
6208- 18 04 00 1B 24 2C AD 15
6210- 36 1E 1E 3F 24 04 00 FD
6218- 27 24 2D 2D 96 92 3F 3F
6220- 24 04 00 39 27 08 58 09
6228- 3F 3F 36 36 36 04 00 CA
6230- 2D F6 3F 0F 18 24 24 0C
6238- 2D 15 04 00 2B 25 08 58
6240- 36 36 36 DF 23 24 24 24
6248- 00 24 3C 0D 96 1A 36 FD
6250- 04 00 08 1B 2B F5 36 36
6258- 1E 3F 20 00 08 18 D8 36
6260- 36 36 4D 39 38 38 60 0C
6268- 0C 04 00 08 18 D8 36 36
6270- 36 2D 2D 04 00 64 0C 36
6278- 36 36 DF 23 24 24 AC 04
6280- 00 92 1B 24 24 24 95 0E
6288- 0E 56 24 24 24 04 00 0B
6290- 18 38 17 36 36 0E 2D 0D
6298- 18 24 24 1C 04 00 92 1B
62A0- 24 24 24 2D AD F6 3F 04
62A8- 00 4A 24 E4 3F 17 36 36
62B0- 0E 6D 1C 1C 04 00 92 1B
62B8- 24 24 24 2D AD F6 3F 0E
62C0- 0E 0E 04 00 08 58 E1 3F
62C8- 17 76 2D 15 F6 3F 0F 18
62D0- 04 00 92 24 24 24 2D DF
62D8- 27 00 0B 18 08 D8 36 36
62E0- 76 2D 0D 18 24 24 24 00
62E8- 08 18 D8 36 36 0E 0E 0D
62F0- 18 0D 18 24 24 04 00 76
62F8- 0E 24 24 24 DF 33 36 36
6300- 2E 20 00 00 FF FF FF FF
```

Shapefile.

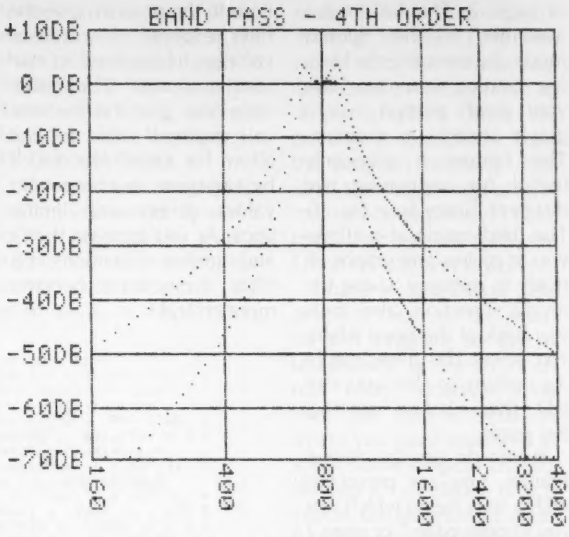

Fig. 3. The same graph as Fig. 1 but with a second filter curve plotted over the first using the overlay feature. The second graph is the same as the first with an additional section added to steepen the skirts and smooth the passband.

You input the cutoff frequency and Q of your design, and within seconds you get a graph for that exact filter. The graph shows the decibels of rejection as a function of frequency. The program can combine up to four cascaded filters and may be used for low-pass, bandpass, and high-pass designs. There are several other options that help make this a very powerful tool for those who enjoy tinkering with active filters.

The program uses the two HIRES screens in the Apple for the actual graphs. When you run the program, you will be presented with a menu where you select the type of filter in which you are interested (low-pass, bandpass, or high-pass). Next, you select the number of sections in your filter and then proceed to a data-input screen. This data-input screen is where you enter the various filter parameters for your filter and also select several graphing options. First you enter the center frequency, which is the frequency on which you want the graph centered. Next, you enter your filter's cutoff or center frequency and then its Q factor. If you are using a three-section filter, you enter the cutoff frequency and Q for each filter section.

After the filter information is entered, you are given several graphing options. First you select either a wide- or a narrow-frequency scale for the graph. The wide scale will generate a graph starting at 1/5th of the center frequency and ending at 5 times the center frequency. The narrow scale runs from half the center frequency to double the center frequency. As an example, if you select a center frequency of 1,000 Hz, then the frequency axis on the graph will go from 200 Hz to 5,000 Hz in wide mode and 500 Hz to 2000 Hz in the narrow mode. In both cases the graph will be centered on 1,000 Hz and will be logarithmic (see Figs. 1 and 2).

The second option is to select either HIRES page 1

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or page 2. The last option available is the overlay mode. By selecting the overlay feature, you can have your graph plotted over a graph already in memory. This feature is especially useful for comparing two different filters (see Fig. 3). The third option also allows you to review any graphs already in memory. Using the review function also puts you back at the point where you select the three graphing options so that you can edit them before plotting the graph.

If you do use the review feature, you are presented with a new menu which lets you choose page 1 or page 2 simply by pushing the 1 or 2 key. You may toggle back and forth between the two in order to compare two graphs in memory. Pushing any other key will return you to the original menu. The review feature also is available from either of the first two menus.

Once you have opted for a new graph or an overlay, the program takes over and begins the plotting procedure. If you selected "new graph," then everything on the HIRES page you selected is erased and a new coordinate grid is calculated and drawn. If you selected "overlay," then the graph will be plotted over whatever graph and coordinate grid that is already in memory.

Next, the graph coordinates are calculated and plotted, and after the graph is drawn, you can return to the main menu by pressing any key. If you want to change the number of points that are plotted, then increase or decrease the STEP values in lines 1010 through 1090. I chose values which seem to give good trade-off between resolution of the graph and amount of time to plot the graph.

A few comments are in order concerning the graphs that are plotted. The equations in the program give the filter response as a ratio of voltages as opposed to current or power. The equations also give the theoretical response and do not allow for errors introduced by variations in component values or op amp limitations. As you increase the Q and number of sections in a filter, these items become more critical.

All of the coordinate grids display a range of 80 dB which converts to .5 dB for each screen pixel, which seems to be a reasonable resolution. You will find that the dB scale for the bandpass filters is different from the low-pass and high-pass. This was done to try to fit the maximum amount of information in the allotted room. The bandpass curves are set up so that the center frequency will always be 0 dB and all other points will be relative to it.

The low-pass is such that frequencies well below the cutoff frequency will be at 0 dB. High-pass is similar to low-pass, only it is frequencies above the cutoff frequency that are at 0 dB. This has been done by ad-

FILTER DESIGNER

```
]

1  GOTO 200
2 L =  LEN (P$): FOR J = 1 TO L: DRAW  ASC ( MID$ (P$,J,1)) - 31 AT X,Y:X =
    X + 7: NEXT : RETURN
3  IF PG% = 1 THEN PG% = 2: POKE  - 16304,0: POKE  - 16297,0: POKE  - 1630
    2,0: RETURN
4  IF PG% = 2 THEN PG% = 3: POKE  - 16299,0: POKE  - 16302,0: RETURN
5 PG% = 1: POKE  - 16300,0: POKE  - 16303,0: RETURN
6 X = 5: GOSUB 2: RETURN
10  IF Y1 = 97 THEN Y1 = 0: RETURN
15 Y1 = 0: FOR J = 1 TO O:F = FF * I ^ W / F(J):D = 1 / Q(J)
20 Y = 40 * ( LOG ((F ^ 4 + ((D ^ 2 - 2) * F ^ 2) + 1) ^ .5)) / A0:Y1 = Y1
    + Y: NEXT
25 X =  LOG (I * 50) / A0 * 150 - 110
30  IF Y1 > 97 THEN Y1 = 97
35  IF Y1 <  - 59 THEN Y1 =  - 59
40  HPLOT X,(Y1 + 68):K =  PEEK ( - 16336):K =  PEEK ( - 16336): RETURN
45  IF Y1 = 97 THEN Y1 = 0: RETURN
50 Y1 = 0: FOR J = 1 TO O:F = FF * I ^ W / F(J):D = 1 / Q(J)
55 Y = 40 * ( LOG (((1 / F ^ 4) + ((D ^ 2 - 2) / (F ^ 2)) + 1) ^ .5)) / A0
    :Y1 = Y1 + Y: NEXT
60 X =  LOG (I * 50) / A0 * 150 - 110
65  IF Y1 > 97 THEN Y1 = 97
70  IF Y1 <  - 59 THEN Y1 =  - 59
75  HPLOT X,(Y1 + 68):K =  PEEK ( - 16336):K =  PEEK ( - 16336): RETURN
80  IF Y1 = 138 THEN Y1 = 0: RETURN
85 Y1 = 0:Y = 1: FOR J = 1 TO O:F = FF * I ^ W / F(J):D = 1 / Q(J)
90 Q = D(J):Y = Y * (((((F ^ 2 - 1) / F) ^ 2) * Q ^ 2 + 1) ^ .5): NEXT
95 Y1 = 40 * ( LOG (Y)) / A0: IF F% = 0 THEN G = Y1: RETURN
100 X =  LOG (I * 50) / A0 * 150 - 110:Y1 = Y1 - G
105  IF Y1 <  - 19 THEN Y1 =  - 19
110  IF Y1 > 138 THEN Y1 = 138
115  HPLOT X,(Y1 + 28):K =  PEEK ( - 16336):K =  PEEK ( - 16336): RETURN
200 P =  PEEK (233):A0 = 2.30258509:W$ = "W":W = 1: HCOLOR= 3: SCALE= 1:PG
    % = 1: DIM D(5),F(5): IF P = 96 THEN 220
210  PRINT  CHR$ (4);"BLOAD FILTER SHAPEFILE,A$6000": HGR : HGR2 : TEXT : POKE
    232,0: POKE 233,96
220  HOME : PRINT "<<<<<<<<<<**********>>>>>>>>>>"
230  HTAB 11: PRINT "ACTIVE AUDIO FILTERS": HTAB 16: PRINT "MAIN MENU"
240  VTAB 6: PRINT "<<<<<<<<<<<<<<<<<<<<*********>>>>>>>>>>>>>>>>>>>>"
250  VTAB 10: PRINT "LOW PASS ---------- 1": PRINT
260  PRINT "BAND PASS ---------- 2": PRINT
270  PRINT "HIGH PASS ---------- 3": PRINT
280  PRINT "EXAMINE GRAPHS ----- 4": PRINT
290  PRINT "END ---------------- 5"
300  VTAB 21: HTAB 21: GET T$:T =  VAL (T$): VTAB 21: HTAB 21: PRINT T$
310  IF T = 1 THEN T$ = "LOW PASS ": GOTO 580
320  IF T = 2 THEN T$ = "BAND PASS": GOTO 580
330  IF T = 3 THEN T$ = "HIGH PASS": GOTO 580
340  IF T = 4 THEN  GOSUB 440: GOTO 220
350  IF T = 5 THEN  END
360  GOTO 300
370  PRINT "     >>> INPUT DESIRED RESPONSE <<<": PRINT : PRINT
380  PRINT "2ND ORDER (1 SECTION) ---------------- 2": PRINT
390  PRINT "4TH ORDER (2 SECTIONS) --------------- 4": PRINT
400  PRINT "6TH ORDER (3 SECTIONS) --------------- 6": PRINT
410  PRINT "8TH ORDER (4 SECTIONS) --------------- 8": PRINT
420  PRINT "EXAMINE CURRENT GRAPHS --------------- E": PRINT
430  PRINT "RETURN TO MENU ----------------------- R": RETURN
440  HOME : VTAB 4: HTAB 8: PRINT "EXAMINE CURRENT GRAPHS": VTAB 8: PRINT
    "PAGE 1 ------------ 1": PRINT : PRINT "PAGE 2 ------------ 2": VTAB 16
    : HTAB 8: PRINT "RETURN - ANY OTHER KEY"
450  VTAB 12: HTAB 20: GET E$
460  IF E$ = "R" THEN  POKE  - 16300,0: POKE  - 16303,0: RETURN
470  IF E$ = "1" THEN  POKE  - 16302,0: POKE  - 16300,0: POKE  - 16304,0: POKE
     - 16297,0: GOTO 450
480  IF E$ = "2" THEN  POKE  - 16302,0: POKE  - 16299,0: POKE  - 16304,0: POKE
     - 16297,0: GOTO 450
490  POKE  - 16300,0: POKE  - 16303,0: RETURN
500  HPLOT 40,08 TO 250,08: HPLOT 40,28 TO 250,28: HPLOT 40,48 TO 250,48: HPLOT
    40,68 TO 250,68: HPLOT 40,88 TO 250,88: HPLOT 40,108 TO 250,108: HPLOT
    40,128 TO 250,128: HPLOT 40,148 TO 250,148: HPLOT 40,167 TO 250,167
510  HPLOT 40,08 TO 40,166: HPLOT 100,08 TO 100,166: HPLOT 145,08 TO 145,1
    66: HPLOT 190,08 TO 190,166: HPLOT 216,08 TO 216,166: HPLOT 235,08 TO
    235,166: HPLOT 250,08 TO 250,166
520  IF T = 2 THEN 540
530 Y = 08:P$ = "+30DB": GOSUB 6:Y = 28:P$ = "+20DB": GOSUB 6:Y = 48:P$ =
    "+10DB": GOSUB 6:Y = 68:P$ = " 0 DB": GOSUB 6:Y = 88:P$ = "-10DB": GOSUB
    6:Y = 108:P$ = "-20DB": GOSUB 6:Y = 128:P$ = "-30DB": GOSUB 6:Y = 148
```

justing the gain in the calculations to place the curve on the graph where it provides the maximum amount of information. In real life if you build a filter, you can select whatever gain you like and it will have the effect of moving the entire curve up or down the vertical axis.

The program is in two parts, an Applesoft program and a shapetable file. The Basic program is entered in the normal fashion with the exception of lines 500 through 550 which must be entered without any spaces in order for them to fit into the Apple's input buffer. The program is heavily dependent upon subroutines, and care should be taken when entering line numbers to avoid branching errors. The shapetable is entered as described in the *Apple Reference Manual*, Chapter 3. The shapetable should begin at $6000, and it has a length of $304. After it is entered, BSAVE it using the filename FILTER SHAPEFILE.

If you have a graphics printer, you can easily add a routine to print the graphs. Add a line 295 to put the printer selection on the main menu. Add line 355 to read "IF T=6 THEN 1200". Starting at line 1200 you would add the printer routines used by your printer to output graphics. After the printing is complete, have the program return to line 220, the beginning of the main-menu sequence. I have used this method with the Epson MX-80, and it works.

I have included error trapping for most of the input for this program so that it usually will ignore an incorrect entry. However, you may run into a situation where you have managed to sneak some illogical character into a calculation which causes the program to error. If this happens, enter "RESET" and "RUN". You will be back at the main menu and any graphs in memory will be maintained intact. If you do not want to enter the program by hand, it is available from me on diskette (DOS 3.3) for $12.00.

If you have an interest in active audio filters and have access to an Apple computer, I am certain that you will find this program fascinating. The graphing routine gives you a very powerful tool to assist in designing filters. With the touch of a few keys, you can see exactly what response you can expect from a given design and a totally new filter may be evaluated in seconds rather than hours. This is the type of application where you can get some real utility from your micro. Good luck and happy filtering. ■

```
    :P$ = "-40DB": GOSUB 6:Y = 167:P$ = "-50DB": GOSUB 6: GOTO 550
540 Y = 8:P$ = "+10DB": GOSUB 6:Y = 28:P$ = " 0 DB": GOSUB 6:Y = 48:P$ = "
    -10DB": GOSUB 6:Y = 68:P$ = "-20DB": GOSUB 6:X = 5:Y = 88:P$ = "-30DB
    ": GOSUB 6:Y = 108:P$ = "-40DB": GOSUB 6:Y = 128:P$ = "-50DB": GOSUB
    6:Y = 148:P$ = "-60DB": GOSUB 6:Y = 167:P$ = "-70DB": GOSUB 6
550 ROT= 16:FF$ =  STR$ (FF * .2 ^ W):X1 = 42: GOSUB 560:FF$ =  STR$ (FF *
    .5 ^ W):X1 = 100: GOSUB 560:FF$ =  STR$ (FF):X1 = 145: GOSUB 560:FF$ =
     STR$ (FF * 2 ^ W):X1 = 190: GOSUB 560: FOR J2 = 3 TO 5:FF$ =  STR$ (
    FF * J2 ^ W):X1 = X1 + (8 - J2) * 5: GOSUB 560: NEXT : ROT= 0: RETURN

560 IF  LEN (FF$) > 4 THEN  FOR J1 = 1 TO 4:X = X1:Y = J1 * 6 + 165:P$ =
     MID$ (FF$,J1,1): GOSUB 2: NEXT : RETURN
570 FOR J1 = 1 TO  LEN (FF$):X = X1:Y = J1 * 6 + 165:P$ =  MID$ (FF$,J1,1
    ): GOSUB 2: NEXT : RETURN
580 HOME : PRINT "=========": INVERSE : PRINT T$: NORMAL : PRINT "=======
    ==": VTAB 7: GOSUB 370: VTAB 22
590 VTAB 22: HTAB 38: GET O$:O =  VAL (O$) / 2: VTAB 22: HTAB 38: PRINT O
    $
600 IF O$ = "R" THEN 220
610 IF O$ = "E" THEN  GOSUB 440: GOTO 580
620 IF O = 1 THEN O$ = "2ND ORDER": GOTO 670
630 IF O = 2 THEN O$ = "4TH ORDER": GOTO 670
640 IF O = 3 THEN O$ = "6TH ORDER": GOTO 670
650 IF O = 4 THEN O$ = "8TH ORDER": GOTO 670
660 GOTO 590
670 TEXT : HOME :P$ = T$ + " - " + O$: REM       GRAPH ROUTINE
680 HOME : PRINT "====================": INVERSE : PRINT P$: NORMAL : PRINT
    "====================": VTAB 5: PRINT "CURRENT FILTER PARAMETERS ARE
    :"
690 VTAB 7: PRINT "CENTER FREQUENCY ";FF: VTAB 9
700 PRINT  TAB( 15);" 'Q'"; TAB( 30);"SECTION": PRINT  TAB( 15);"FACTOR";
     TAB( 29);"FREQUENCY": VTAB 11: PRINT "1ST SECTION",Q(1),F(1)
710 IF O > 1 THEN  PRINT "2ND SECTION",Q(2),F(2)
720 IF O > 2 THEN  PRINT "3RD SECTION",Q(3),F(3)
730 IF O > 3 THEN  PRINT "4TH SECTION",Q(4),F(4)
740 VTAB 16: PRINT "CHANGE VALUES (Y/N) ";
750 GET Y1$: VTAB 16: HTAB 21: PRINT Y1$: IF Y1$ = "N" THEN 820
760 VTAB 16: HTAB 1: INPUT "CENTER FREQUENCY (HZ) ";FF
770 VTAB 19: PRINT "1ST SECTION:": VTAB 19: HTAB 16: INPUT Q2$: HTAB 32: VTAB
    19: INPUT F2$:Q(1) =  VAL (Q2$):F(1) =  VAL (F2$)
780 IF O > 1 THEN  VTAB 20: PRINT "2ND SECTION:": VTAB 20: HTAB 16: INPUT
    Q4$: HTAB 32: VTAB 20: INPUT F4$:Q(2) =  VAL (Q4$):F(2) =  VAL (F4$)
790 IF O > 2 THEN  VTAB 21: PRINT "3RD SECTION:": VTAB 21: HTAB 16: INPUT
    Q6$: HTAB 32: VTAB 21: INPUT F6$:Q(3) =  VAL (Q6$):F(3) =  VAL (F6$)
800 IF O > 3 THEN  VTAB 22: PRINT "4TH SECTION:": VTAB 22: HTAB 16: INPUT
    Q8$: HTAB 32: VTAB 22: INPUT F8$:Q(4) =  VAL (Q8$):F(4) =  VAL (F8$)
810 GOTO 670
820 VTAB 18: PRINT "FREQUENCY SCALE - WIDE/NARROW (W/N) ";
830 GET W$: HTAB 37: VTAB 18: PRINT W$
840 W = 1: IF W$ = "N" THEN W = .430676559: GOTO 860
850  IF W$ <  > "W" THEN 820
860 VTAB 20: PRINT "PAGE 1 OR PAGE 2  (1/2) ";
870 GET PG$:PG% =  VAL (PG$) + 1: HTAB 25: VTAB 20: PRINT PG$
880 IF PG% < 2 OR PG% > 3 THEN 860
890 VTAB 22: PRINT "GRAPH - NEW/OVERLAY/REVIEW  (N/O/R) ";
900 GET Y$: HTAB 37: VTAB 22: PRINT Y$
910  IF Y$ = "N" THEN 940
920  IF Y$ = "O" THEN 940
930  IF Y$ = "R" THEN  GOSUB 440: GOTO 670
940 PG% =  VAL (PG$) + 1: IF Y$ = "N" THEN 980
950  IF Y$ <  > "O" THEN 890
960 Y1 = 0: POKE  - 16302,0: POKE  - 16304,0: POKE  - 16297,0: IF PG% = 2 THEN
     POKE  - 16300,0: POKE 230,32: GOTO 1000
970  IF PG% = 3 THEN  POKE  - 16299,0: POKE 230,64: GOTO 1000
980  IF PG% = 2 THEN  HGR : POKE  - 16302,0:X = 70:Y = 3: GOSUB 2: GOSUB 5
    00:Y1 = 0
990  IF PG% = 3 THEN  HGR2 :X = 70:Y = 3: GOSUB 2: GOSUB 500:Y1 = 0
1000  IF T = 2 THEN 1050
1010  IF T = 3 THEN 1070
1020  FOR I = .204 TO 1.96 STEP .04: GOSUB 10: NEXT
1030  FOR I = 2 TO 3 STEP .1: GOSUB 10: NEXT
1040  FOR I = 3.25 TO 4.75 STEP .25: GOSUB 10: NEXT : GOTO 1100
1050 F% = 0:I = 1: GOSUB 85:F% = 1: FOR I = 4.95 TO 2 STEP  - .25: GOSUB 8
    0: NEXT
1060  FOR I = 1.96 TO .204 STEP  - .04: GOSUB 80: NEXT : GOTO 1100
1070  FOR I = 4.75 TO 3 STEP  - .25: GOSUB 45: NEXT
1080  FOR I = 2.9 TO 2 STEP  - .1: GOSUB 45: NEXT
1090  FOR I = 1.96 TO .204 STEP  - .04: GOSUB 45: NEXT
1100  POKE  - 16368,0: GET P$: GOSUB 5: GOTO 220
```

Program listing.

References

Manual of Active Filter Design, Hilburn & Johnson, McGraw-Hill Book Co., 1973.

Active Filter Design Handbook, Maschytz & Horn, John Wiley & Sons, 1981.

Active Filter Cookbook, Don Lancaster, Howard W. Sams & Co., 1975.

"Design Your Own Active Filters," H. M. Berlin, *QST*, June, 1977.

"Active Bandpass Filters," T. A. Conboy, *Ham Radio*, December, 1977.

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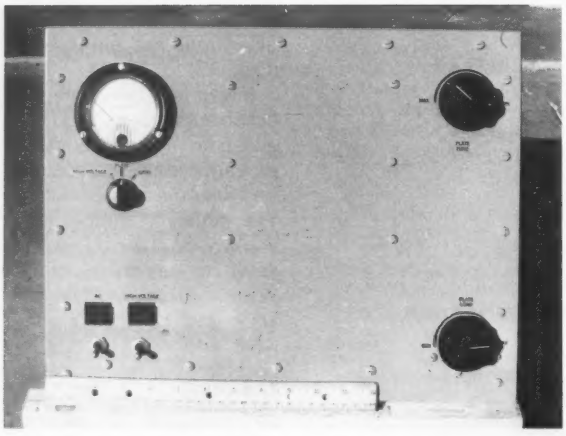


Front view of amplifier.

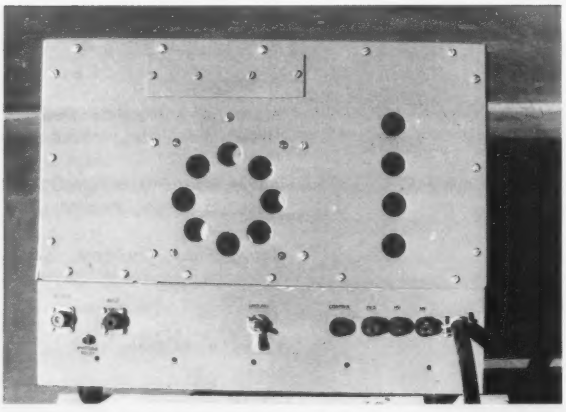
The addition of the 160-meter band to most amateur transceivers since the 60s has steadily increased interest in the "top band" to the point that it sounds like 75 phone during periods of good propagation. Often plagued by noisy atmospheric conditions and marginal antenna systems, this band is a prime candidate for an amplifier that will allow consistent communications.

With these considerations in mind, the AKF 160/1000 came about. (Its name is derived from the fact that it was built for my father, WØAKF. The "160/1000" is self-explanatory.)

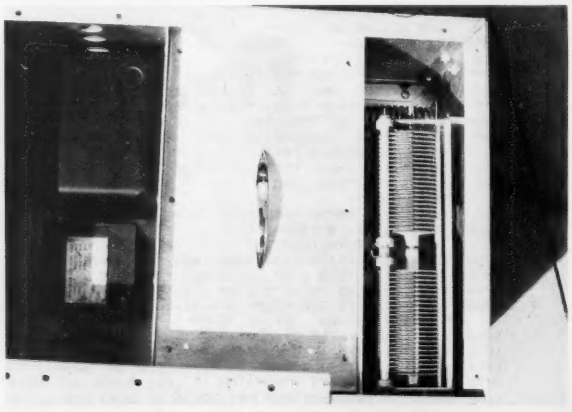
Primary design considerations for the construction of the 160/1000 were:

- single band—160 meters only
- low cost, using on-hand or readily available surplus parts
- must be "desk-top" and capable of 1 kW dc input
- tube(s) must be readily available and inexpensive

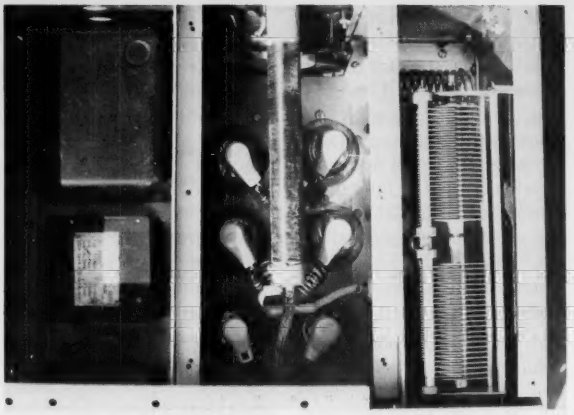
The final choice of tubes (811As) was primarily dictated by the above consider-



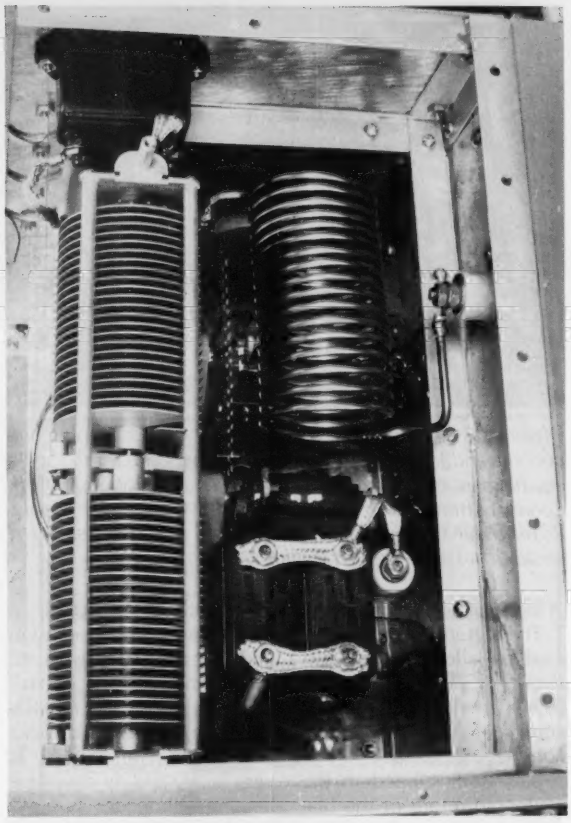
Rear view of amplifier showing intake and exhaust ports.



Top view of amplifier with tube chamber covered.



Top view of amplifier with tube chamber exposed. Note ZD1 in front of the filament transformer.



Side view of amplifier showing the plate tune and pi-net coil. Note the Plexiglas sheet forming the near chamber wall, and also the surplus mica capacitors.

ations. Also, suitable filament and plate transformers were on hand. The venerable 811A triode has been used in many proven commercial and home-brew amplifier designs over the years and is still available—both new and used—for less than $15.00.

The circuit is a straightforward grounded-grid design using six 811As in parallel. I found that the input and plate-load impedances for a single 811A were 300 and 5k Ohms, respectively. This is equal to 50 and 833 Ohms, respectively, when six tubes are used in parallel. I found this to be desirable for several reasons:

- The 50-Ohm input Z would make it easy to drive with a solid-state transceiver, even with no tuned input circuit. (A 1:1 pi-net input was used anyway.)
- Although the 833-Ohm plate Z will result in high values of plate-tune and plate-load capacitances when looking into a standard pi-net, smaller variable capacitors are easily padded into the approximate tuning range by fixed values.
- The low plate Z also allows use of a smaller value of inductance which in turn saves space. (I tried several toroidal inductors but had difficulty with core heating—probably due to high current flow.)

A single dual-movement meter with appropriate shunts was used for monitoring the three standard circuit functions. They are:

- plate current (0–1.5 Amps)
- grid current (0–1 Amps)

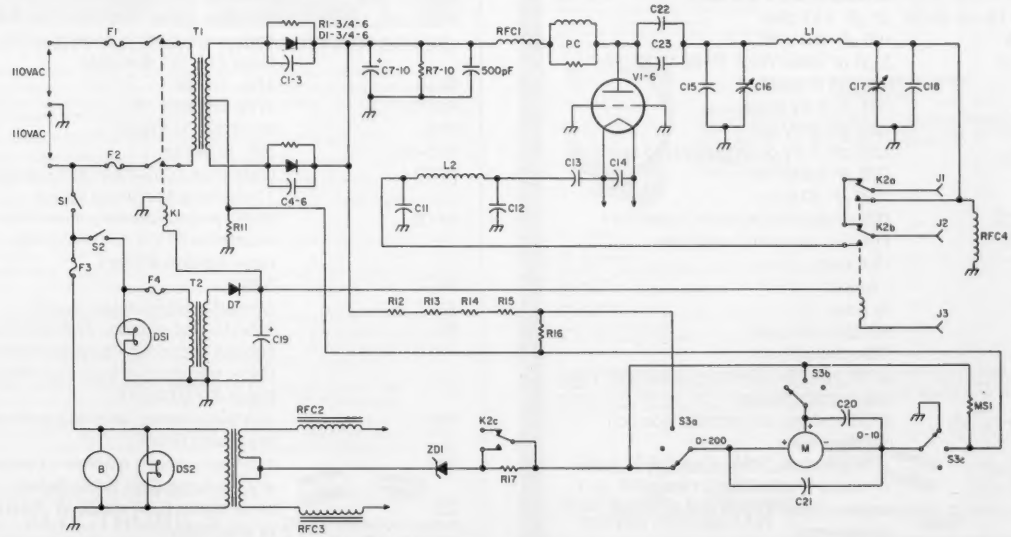
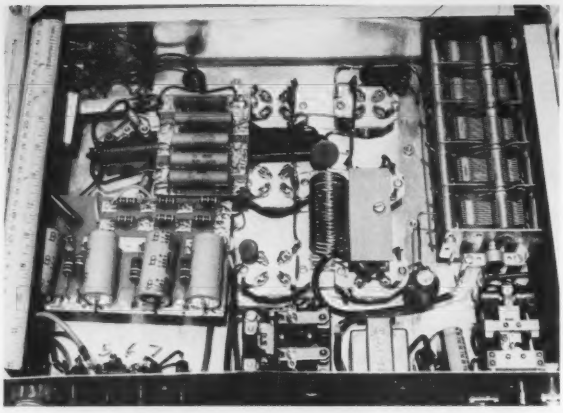


Fig. 1. Schematic.



Under-chassis view of the amplifier. Left: power-supply components and HV-meter multiplier resistors. Center: tube sockets, filament choke, and input pi-net mounted on a standoff. Center bottom: ac power relay and 24-V-dc power supply. Right: input loading capacitor, antenna relay, and safety rf choke.

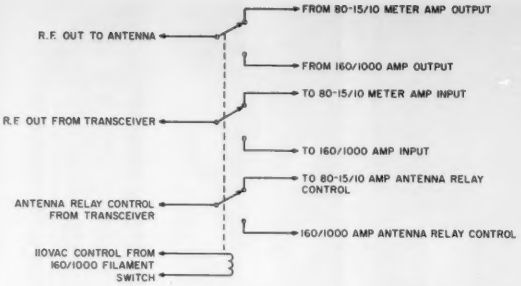

FROM 80-15/10 METER AMP OUTPUT
R.F. OUT TO ANTENNA
FROM 160/1000 AMP OUTPUT
TO 80-15/10 METER AMP INPUT
R.F. OUT FROM TRANSCEIVER
TO 160/1000 AMP INPUT
TO 80-15/10 AMP ANTENNA RELAY CONTROL
ANTENNA RELAY CONTROL FROM TRANSCEIVER
160/1000 AMP ANTENNA RELAY CONTROL
110VAC CONTROL FROM 160/1000 FILAMENT SWITCH

Fig. 2. Amplifier switching circuit for using two station amplifiers with a common antenna switching system. Alleviates cable swapping when going from one amp to another.

● high voltage (0–2 kV dc)

The metering can be modified to allow use of just about any low-cost or surplus instrument. In fact, separate meters for each function may be desirable.

Bias is developed in the center-tap return of the filament transformer by using a 6.2-V, 50-Watt zener diode. Zero signal plate I was found to be about 100 mA. Plate I is cut off during receive by resistor R17.

The power supply is a standard full-wave design and uses a surplus plate transformer rated at 500 mA CCS (available from Fair Radio Sales). Though it looks small, the transformer is very heavy and no excessive heating will occur.

Many component changes can be made to suit parts on hand as long as voltage ratings and values are observed. The main point is to not be afraid to experiment with different parts and layouts.

If your station already has an 80–15/10-meter amplifier, the circuit in Fig. 2 will allow automatic switching of rf and control functions between the two amps. This of course alleviates the cable-swapping behind the operating desk. It uses surplus DPDT power relays with 110-V-ac coils and is activated when the 160/1000 filaments are turned on. It was constructed in an aluminum minibox and placed near the station antenna switch.

Construction

The general layout and construction techniques I used should be evident from the photos.

Due to the low frequency, lead lengths are not as critical as they would be in the upper HF spectrum. However, your final layout should be such that leads are heavy, direct, and as short as possible.

I prefer using a commercial chassis as the amp foundation, then surrounding it with ⅛″-thick aluminum sheet held together with ¾″ aluminum angle and #8 or #10 hardware. Scrap aluminum sheet is fairly inexpensive, and when only straight cuts are required, the total cost of a heavy-duty rf-tight cabinet can be quite low.

Of special interest is the

Parts List

B	4″ muffin fan, 115 V ac	MS	meter shunt to match M above
C1–6, 13–14, 20–21	.01 μF, 1 kV disc	PC	parasitic choke: two 100-Ohm, 2-Watt carbon resistors in parallel with 4 turns #14, ½″ diameter
C7–10	100 μF, 450 V dc		
C11–12	3330 pF silver mica (three 1000s and one 330 in parallel)	R1–6	470k, 1 Watt
		R7–10	470k, 2 Watts
C15	.001 μF, 5 kV mica	R11	50 Ohms, 12 Watts
C16	1000 pF, 2 kV dc	R12–16	50k, 10 Watts
C17	2000 pF, 1 kV dc (receiver-type spacing)	RFC1	plate choke (370 turns #24 enamel on 1″-diameter hardwood dowel)
C18	.005 μF, 2.5 kV dc		
C19	1000 μF, 50 V dc	RFC2	bifilar-wound filament choke (#10 enamel to fill 7½″ × ½″ ferrite rod—Amidon Assoc.)
C22–23	.002 pF, 5 kV mica block capacitors		
DS1–2	115-V-ac pilot-lamp assembly		
F1–2	15 Amps	S1–2	SPST
F3	2 Amps	S3	3-pole/3-position rotary switch
F4	½ Amp	T1	115/115-V-ac primary; 2250-V-ac c-t, 500-mA secondary (surplus Collins Radio transformer from Fair Radio Sales #TF1UX02YY)
J1–2	SO-239 coax jack		
J3	RCA chassis jack		
K1	DPST or DPDT 25-Amp contacts/24-V-dc coil (surplus relay)		
K2	3PDT 10-Amp contacts/24-V-dc coil (surplus relay)	T2	115-V-ac primary; 24-V-ac c-t secondary (Radio Shack)
L1	17½ turns, #6, 2″ diameter	T3	115-V-ac primary; 6.3-V-ac c-t secondary, 24 Amps (Fair Radio Sales)
L2	17 turns, 1″ diameter, 2″ long		
M	surplus meter (0–200 and 0–10-mA movements)	ZD	zener diode, 6.2 V dc, 50 W, TO-3 case or stud mount

amplifier cooling. The six tubes are enclosed in a chamber formed of aluminum sheet and Plexiglas™ (the wall between the tubes and the pi-net is ¼" Plexiglas). Air is forced through the chamber using a standard muffin fan. A 1" gap in the front of the chamber top plate allows the air to move into the power-supply area. Four holes behind the plate transformer allow the air to exit the cabinet. This has the added effect of providing air circulation around the plate transformer.

Operation

This amplifier has room to spare when it comes to power output. Since the number of tubes and plate voltage may vary from amp to amp, no discrete tuning information is given. However, outputs in excess of 1100 Watts have been achieved when operating into a dummy load. I have found that tuning for maximum power output and then decreasing the drive level to the legal limit seems to give the best linearity. Check your metering and watch your signal on a monitor scope (the best piece of equipment a ham can have in his station). No evidence of flat-topping has been noticed, and the output appears to be a linear reproduction of the input when driven by a TS-830S at full power and viewed on the station monitor.

On-the-air comments have been excellent, with much interest expressed in the number and type of tubes. It is hoped that the 811A fanatics among you will add two more tubes and try construction of this amp. Good luck.

Special thanks go to my father, WØAKF, for his patience while I built this amp. The greatest reward is to hear him using it during our twice-weekly schedule. ■

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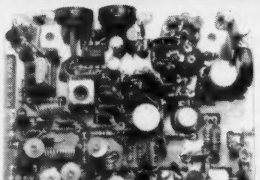

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NEVER SAY DIE
editorial by Wayne Green

from page 6

situation by Tim. He's been making considerable progress, with several more licensed hams in immediate prospect...and more to come. Perhaps my talks are having some results? Old Doc Green gave the Computex opening-ceremonies address to a good-sized audience of Chinese businessmen.

My message for them is the same as for America—If Taiwan wants to be able to cope with the electronics revolution, it has to have engineers, technicians, and scientists to develop new products, to help make, sell, operate, and service them. Lacking technical people, Taiwan will have to just make do by copying the designs of others; they will always be two or three years behind.

And how does a country develop the needed technical people? Simple, really, just make sure that you expose kids 14 and 15 years old to high-tech hobbies such as amateur radio. It's no coincidence that Japan has ham-radio clubs in every high school in their country. They are, as a result, graduating seven times as many electronics engineers as the US, and with half our population! Thus, Japan has been able to take away virtually every consumer electronics industry from the entire world, including the US.

The electronics revolution has a long way to go, so there's still time for countries like Taiwan to develop the needed technical people and get in there and compete with Japan ...designing state-of-the-art technical products and thus getting a good piece of the action. But without getting ham-radio clubs into every school on Taiwan, the country will be sentenced to copying—to stealing the ideas of others—as they have with their Chinese copies of the Apple and IBM computers and Rolex and Tiffany watches.

I've been giving this message in my talks to business groups in Taiwan for several years and I think the message is beginning to take. Now if I could only get some attention here in the US!

From Taiwan I went on to Hong Kong to see some more potential manufacturers and buy some goodies. The prices are best there for Sony, Seiko, and so on. The whole tour to four countries took just two weeks and got me back just in time for the Chicago Summer Consumer Electronics Show and then my yearly *USS Drum* submarine reunion.

Sherry was with me on the tour, going on to Manila from Hong Kong to see her suppliers. She imports some clever cloth and wire butterflies which she sells through gift shops and florists. She then met me in Mobile for the reunion, missing CES.

Now, about Taiwan and that DXpedition. My first thought was that it might be possible to work out something which would coincide with the October tour of Asian consumer electronics shows. I've been on that tour many times and will be going again this year. In two weeks, this gets you to electronics shows in Tokyo, Taiwan, Hong Kong, and Seoul...nine different shows in two weeks!

There are usually 200 to 300 on this tour, a good percentage of whom are hams, so it would be a natural if the DXpedition could be tied in with the tour. Unfortunately, with magazine deadlines taking so much time, there just wasn't enough time to get the word out, make all the ar-

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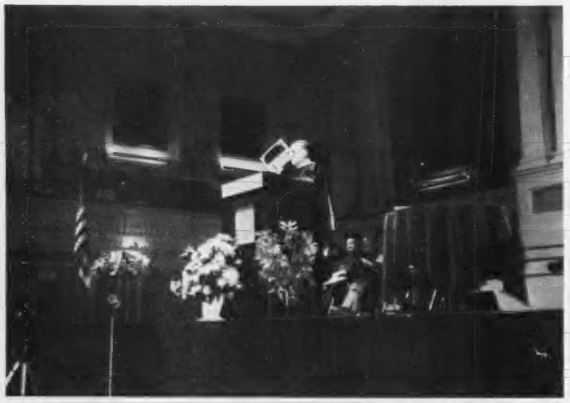

Dr. Green shaking a Model 100 computer at the Central New England College graduating class, threatening them with the coming need for a massive increase in communications in order to cope with the computer revolution.

Tim Chen BV2A wants you to come and DXpedition from Taiwan. How about it?

Some of the 1984 Computer Show Tour Group visiting a Korean computer factory.

Tokyo Disneyland is an immaculate must. A kid spilled some popcorn and within seconds three people appeared from nowhere and cleaned it up.

rangements, and have things in order by October first.

I talked with Tim about the possibility of my bringing a repeater over and setting it up so that the American operator team could have good personal communications. Possible, but this will take some education of those in charge and some dickering. I talked with Bob Chang, who runs Commerce Tours, and he said he could arrange with the Ambassador Hotel for a safe place to set up the repeater.

We're going to have quite a ham contingent on the '84 October show tour, so I'd been thinking in terms of arranging for us to get HTs in Japan which we could use in Hong Kong and Korea...and perhaps even Taiwan. The turmoil of my merger with CW Communications and starting several new magazines and businesses scotched the HT plan for this year. Maybe in '85.

If about ten of you would be interested in getting over to see Tim and operating for about five or six days from Taipei next spring, drop me a line. I would estimate that the whole trip would cost about $3,000 which would include transportation, hotels, a week in Taiwan, plus a few days in Tokyo and Hong Kong. By then we may be able to work out the two-meter repeater and HT situation.

If I can get ten positive and a few more possible candidates for the DXpedition, I'll start Commerce on setting up the arrangements and start working with Tim to cover the legal formalities.

Have you ever wondered what it's like to operate from the heart of Asia? To get on from a rare spot and have the whole world beating your brains out for a contact? It's heady stuff. I've operated from some pretty rare spots and it's really addictive. Why leave all the real DXing to Lloyd and Iris?

Computer nuts will go right out of their minds when they see the prices for Apple- and IBM-compatible boards in Taipei. And almost every American computer book is available for a couple bucks, reprinted there.

The food is superb and the sights incredible, from their museums to Snake Alley. Your camera will be snapping day and night. So, are you game for a little DXpedition to the Republic Of China next May, running from about May 15th to 30th?

Who knows, between the Computex computer show in Taiwan and the products made in the People's Republic of China—which you can visit on the same trip, going up for a one-day visit from Hong Kong—you might find a product to import and distribute. That would make this a business trip, right?

Your wife? Why not? There's no shortage of things for her to see while you are busy filling your log with contacts. And a businessman really needs some sort of assistant on a trip like this...to get details and prices from manufacturers while you are DXing.

If you can get away for more than two weeks, for a few bucks extra you can return via some interesting places and maybe get in a few more days DXing. A little over a year ago I made the trip back from Hong Kong, stopping off to work DX from Bangkok, Singapore, Kuching (Sarawak), Bandar Seri Begawam (Brunei), Kota Kinabalu (Sabah), and Manila. If you're interested in operating from any of these places, I can put you in touch with a local ham who will help you and perhaps even let you use his station for a couple of days. Brunei is a new country now...how about it?

Akihabara, made into a pedestrian mall on Sundays, is an electronics Mecca. There are hundreds of electronics, radio, and computer stores all in one part of Tokyo. Several American hams visiting here have tried to defect.

Some Chinese dinners are memorable! You won't forget your Taiwan visit.

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Send to Advertising Department, *73*, Elm Street, Peterborough NH 03458.

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WANTED: Cash paid for used SPEED RADAR EQUIPMENT. Write or call: Brian R. Esterman, PO Box 8141, Northfield IL 60093; (312)-251-8901. BNB030

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FOR RENT: "Ham-Home," northern Virginia, five miles southwest of Pentagon, three bedrooms, "family room," 50-foot telephone pole, tribander, 14-el two-meter, 40/80-meter dipole, ½ acre, fenced yard. Available August '84. K1CTK/4 Use *Callbook* address. Phone (703)-379-7437 evenings. BNB168

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ROM-116 FOR TRS-80 RTTY with 5 program tapes and instruction manuals. 1.3 version. $200.00 or best offer. Ken Eaton, 6418 W. 78 St., Prairie Village KS 66204. BNB173

FREE CATALOG on new & used computers, hardware, keyboards, tapes, multiplexers, CRTs, etc. IN-X-SALES, Dept. A, Box 45, Tilton NH 03276; (603)-286-3082. BNB174

EIMAC 8874s, new, $160. W9ZR; (414)-434-2938. BNB175

FOR SALE OR TRADE—68' Rohn 25G foldover tower. Complete with double-guy kit. 2 years old. Presently in storage. $750.00. Mike Nelson KB9RJ, 3212 Glendale Ave., La Crosse WI 54601; (608)-788-8153. BNB176

RARE RUSSIAN-BUILT O'SCOPE, dual beam, full features, English front panels and tech manual, all accessories, A-1 shape. $400 + postage. J. Snaper, PO Box 5948, APO NY 09633. BNB177

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TWO-WAY RADIO SYSTEM—450 MHz. Includes 107 mobile units, base stations, duplexers, schematics, digital equipment, and more. Contact Carl Woodby, Ann Arbor Transportation Authority, 3700 Carpenter Road, Ypsilanti MI 48197; (313)-973-6500. BNB179

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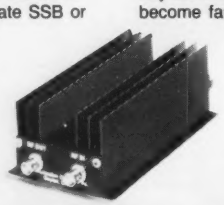

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SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine *by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices,* 73 Magazine, *Pine St., Peterborough NH 03458.*

POMONA CA
AUG 4

The Tri-County Amateur Radio Association will hold its annual hamfest on Saturday, August 4, 1984, from 8:00 am to 4:00 pm, at Palomares Park Recreation Hall, 491 E. Arrow Highway (the north side of Arrow Highway at Orange Grove, between Towne and Garey), Pomona CA. Admission is a $1.00 donation. Swap tables (2½' × 8') are a $5.00 donation per table and the hall will open at 7:00 am for setup only. Tables are limited and must be reserved in advance (no personal tables will be allowed inside or outside the hall). Food, drink, and free parking will be available. Features will include awards, programs, and VCR tapes; and examinations will be given, if possible, for Novice, Technician, General, and Advance class licenses. Talk-in on 146.025+. For advance registration, make checks payable to TCARA and send with an SASE to Joe Lyddon WB6UFX, 6879 Sard Street, Alta Loma CA 91701.

TRAIL BC CAN
AUG 4

The Beaver Valley Amateur Radio Club will hold a swapfest on August 4, 1984, beginning at 10:00 am, at the Cominco Arena, Trail BC. Talk-in on 146.84/.24. For further information and reservations for table space, please contact BVARC, c/o 3798 Woodland Drive, Trail BC V1R 2V7.

JACKSONVILLE FL
AUG 4-5

Six amateur radio clubs of the greater Jacksonville area will sponsor the eleventh annual Greater Jacksonville Hamfest on August 4-5, 1984, at the Orange Park Kennel Club, US 17 South near I-295. Registration is $4.00; swap tables are $9.00 for one day or $15.00 for the weekend. (All proceeds go to the promotion of amateur radio.) Saturday hours are 8:00 am to 5:00 pm and Sunday hours are 9:00 am to 3:00 pm. Features will include a large swap-table area, forums and programs, exhibitors, and plenty of free parking. Special discounts and promotions are available to exhibitors contracting for space before July 15th. For registrations, swap tables, special hotel rates, and more information, write Mike Parnin N4EPD, 6716 Diane Road, Jacksonville FL 32211.

LEVELLAND TX
AUG 5

The Northwest Texas Emergency Net and the Hockley County Amateur Radio Club will sponsor the 19th annual Northwest Texas Emergency Net Swapfest and Picnic on Sunday, August 5, 1984, beginning at 8:00 am, in the City Park, Levelland TX. A $3.00 registration fee is requested but not required. This is a family event, so bring your own picnic basket. Tables will be provided for the all-day swapping. Talk-in on .28/.88. For more information, contact John R. Bell W5NGX, 208 Pat Street, Levelland TX 79336.

PITTSBURGH PA
AUG 5

The 47th annual South Hills Brasspounders and Modulators Hamfest will be held on August 5, 1984, from 9:00 am to 4:00 pm, at the south campus of the Community College of Allegheny County, Pittsburgh PA. Tickets are $3.00 each or 2 for $5.00. There will be indoor and outdoor flea-market space, food, refreshments, and free parking will be available. Talk-in on 146.13/.73 and 146.52 simplex. For further information, contact Jack B. Wood, 448 Jenne Drive, Pittsburgh PA 15236.

ANGOLA IN
AUG 5

The Steuben County Radio Amateurs will present the 26th annual FM Picnic and Hamfest on Sunday, August 5, 1984, at Crooked Lake, Angola IN. Admission is $2.50. Features will include picnic-style BBQ chicken, inside tables for exhibitors and vendors, a large electronics flea market, and overnight camping (fee charged by County Park). Talk-in on 146.52 and 147.81/.21.

AUSTIN TX
AUG 10-12

The Austin Amateur Radio Club and the Austin Repeater Organization will sponsor Austin Summerfest '84 on August 10-12, 1984, at the Austin Marriott Hotel, Interstate 35 at Highway 290. Admission is $5.00 in advance (deadline: July 31st) and $7.00 at the door. Swapfest tables are available on a first-come, first-served basis, but each seller may reserve tables in advance (limit 2) for $1.00 each and claim them by 10:00 am Saturday. Activities will include a 20-kHz 2-meter band-plan forum, a packet-radio discussion and demonstration, a transmitter hunt, and a full schedule of ladies' programs. Admission to the ladies' events is $4.00. Talk-in on 146.34/.94. For more information, write Austin Summerfest '84, PO Box 13473, Austin TX 78711.

TACOMA WA
AUG 11-12

The Radio Club of Tacoma (W7DK) will present Hamfair 1984 on August 11-12, 1984, at Olsen Auditorium on the campus of Pacific Lutheran University. Registration is $5.00 and trailer and dormitory space will be available on campus at reasonable rates. Advance registration is available for the Saturday-night banquet, commercial space, and flea-market tables. Talk-in on 147.88/.28 (W7DK). For additional information and advance registration, please contact Grace Teitzel AD7S, 701 South 120th, Tacoma WA 98444.

CHARLOTTE VT
AUG 11-12

The annual BARC International Hamfest will be held on Saturday and Sunday, August 11-12, 1984, at the Old Lantern Campgrounds, Charlotte VT. Tickets are $4.00 for both days and heterodynes under 12 will be admitted free. Flea-market space is $2.00 and indoor space is $5.00. Overnight camping will be available and features will include the Can-Am tug-of-war. Talk-in on .34/.94, .01/.61, and .52 simplex. For additional information, contact Roger Farley WA1OZE, President, Burlington ARC, PO Box 312, Burlington VT 05402.

CANYON TX
AUG 11-12

The Panhandle Amateur Radio Club, Inc., will hold its annual hamfest on Saturday and Sunday, August 11-12, 1984, in the Student Activities Center, West Texas State University, Canyon TX. Doors will open at 8:00 am each day with plenty of free tables and space for all. Registration per person is $5.00 in advance and $6.00 at the door. Features will include a swapfest, commercial distributors, meetings, and a ladies program. Talk-in on 146.94 and 3.933 MHz. For more information on pre-registration, motels, and RV camps, contact the PARC, PO Box 10221, Amarillo TX 79116, or Jim Ogle WB5UDX at (806)-359-1002.

WARRINGTON PA
AUG 12

The Mid-Atlantic Amateur Radio Club will hold its annual hamfest on Sunday, August 12, 1984, from 9:00 am to 4:00 pm, rain or shine, at the Bucks County Drive-In, Route 611, Warrington PA (5 miles north of the Willow Grove exit of the Pennsylvania Turnpike). Admission is $3.00 with $2.00 additional for each tailgate space (bring your own table). Ample parking and refreshments will be available. Talk-in on 147.66/.06 (WB3JOE/R) or 146.52. For further information, write MARC, PO Box 352, Villanova PA 19085, or call Bob Josuweit WA3PZO at (215)-449-9727.

WILLOW SPRINGS IL
AUG 12

The 50th annual Hamfesters' Hamfest will be held on Sunday, August 12, 1984, at Santa Fe Park, 91st and Wolf Road, Willow Springs IL (southwest of Chicago). Tickets are $3.00 in advance and $4.00 at the gate. There will be an exhibitors' pavilion and the famous swappers' row. Talk-in on 146.52. For advance tickets, send a check or money order to Hamfesters, PO Box 42792, Chicago IL 60642.

GEORGETOWN KY
AUG 12

The Bluegrass Amateur Radio Society will sponsor the Central Kentucky ARRL Hamfest on Sunday, August 12, 1984, from 8:00 am to 5:00 pm, at Scott County High School, Lonlick Road and US Route 25, Georgetown KY (off I-75/64). Tickets are $3.50 in advance and $4.00 at the gate. There is no charge for outside flea-market space. Features will include technical forums, awards, and exhibits in a/c facilities. For more information or tickets, write Edward B. Bono WA4ONE, PO Box 4411, Lexington KY 40504.

ST CLOUD MN
AUG 12

The St. Cloud Amateur Radio Club will hold its annual hamfest on Sunday, August 12, 1984, from 8:00 am to 4:00 pm, at the Sauk Rapids Municipal Park, Sauk Rapids MN. Talk-in on 146.34/.94. For further information, contact the St. Cloud Amateur Radio Club, PO Box 141, St. Cloud MN 56302.

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↩ See List of Advertisers on page 98

HAVRE MT
AUG 17-19

The Northcentral Montana Hamfest will be held on August 17-19, 1984, in Beaver Creek Park at Marden's Campground, 28 miles south of Havre MT.

OAKLAND NJ
AUG 18

The Ramapo Mountain ARC (WA2SNA) will hold its 8th annual flea market on August 18, 1984, at the Oakland American Legion Hall, 65 Oak Street, Oakland NJ (just 20 miles from the GW Bridge). Admission is $1.00 and non-ham family members will be admitted free. Indoor tables are $6.50 and tailgating is $3.00. Talk-in on 147.49/146.49 and .52. For more information, contact Tom Risseeuw N2AAZ, 63 Page Drive, Oakland NJ 07436, or call (201)-337-8389 after 6:00 pm.

HUNTSVILLE AL
AUG 18-19

The Huntsville Hamfest will be held on Saturday and Sunday, August 18-19, 1984, at the Von Braun Civic Center, Huntsville AL. There is no admission charge. Flea-market tables are $4.00 per day and should be reserved in advance. There will be exhibits, forums, an air-conditioned indoor flea market, and non-ham activities. Tours of the Alabama Space and Rocket Center are available for the family. A limited number of camping sites with hookups are available at the VBCC on a first-come, first-served basis. Talk-in on .34/.94. For more information, write Huntsville Hamfest, 2804 S. Memorial Parkway, Huntsville AL 35801.

LAFAYETTE IN
AUG 19

The Tippecanoe Amateur Radio Association will hold its 13th annual hamfest on Sunday, August 19, 1984, beginning at 7:00 am, at the Tippecanoe County Fairgrounds, Teal Road and 18th Street, Lafayette IN. Tickets are $3.00. Features will include a large flea market, dealers, and refreshments. Talk-in on .13/.73 and .52. For advance tickets and more information, write Lafayette Hamfest, Route 1, Box 63, West Point IN 47992.

TRUMANSBURG NY
AUG 25

The Finger Lakes Hamfest will be held on August 25, 1984, at the Trumansburg Fairgrounds, 12 miles NW of Ithaca NY. There will be exhibits, a flea market, refreshments, and overnight camping. For more information, contact Wanda Lovejoy KO2X, 443 Jerry Smith Road, Lansing NY 14882.

BLOSSBURG PA
AUG 25

The Tioga County Amateur Radio Club will hold its 8th annual hamfest on Saturday, August 25, 1984, from 9:00 am to 5:00 pm, at Island Park, Blossburg PA, just off Route 15. Admission is $3.00 and XYLs and children will be admitted free. Features will include a flea market, dealers, traders, demonstrations of computers and 2-way ATV, a QSL contest, an on-premise transmitter hunt, programs for XYLs and harmonics, and radio-controlled airplanes. A snack bar will be available. Talk-in on 146.19/.79, 146.52/.52, and CB. For more information, contact Carl E. Kimble WB3EUE, PO Box 37, Cowanesque PA 16918, or phone (814)-367-5345.

HERSHEY PA
AUG 26

The Central Pennsylvania Repeater Association, Inc., will hold its 11th annual Hamfest/Computerfest on August 26, 1984, adjacent to Hersheypark, Hershey PA. Registration is $3.00 and wives and children will be admitted free. There will be a special reduced admission to Hersheypark for families of registrants. At the large indoor dealer and flea-market area, 10-foot spaces are $8.00 each, 8-foot tables are $4.00 each, and single electric plugs are $1.00 each. A large outdoor tailgating area and food and refreshments will be available also. Talk-in on 145.47, 146.76, and 146.52 MHz. For further information, contact Timothy R. Fanus WB3DNA, 6140 Chambers Hill Road, Harrisburg PA 17111, or phone (717)-564-0897 between 12:00 noon and 8:00 pm, or contact Barrie L. Schwartz W3ENL, Hamfest Secretary, 3545 September Drive, Camp Hill PA 17011, or phone (717)-763-8728.

MARYSVILLE OH
AUG 26

The Union County Amateur Radio Club will hold its 8th annual hamfest on Sunday, August 26, 1984, beginning at 6:00 am, at the fairgrounds in Marysville OH. Tickets are $2.50 in advance and $3.00 at the gate; XYLs and children will be admitted free. A 10-foot flea-market space is $1.00 (no electricity available). There will be food. For further information and tickets, contact Gene Kirby W8BJN, 13613 US 36, Marysville OH 43040, or phone (513)-644-0468.

CHEROKEE OK
AUG 26

The 2nd annual Great Salt Plains Hamfest will be held on August 26, 1984, from 9:00 am to 5:00 pm, at the Community Building on the south side of the Great Salt Plains Lake in north-central Oklahoma. Features will include technical forums, organizational meetings, free swap tables, refreshments, Novice exams, and a noon pot-luck dinner. Overnight camping and RV hookups are available at the Lakes State Park. Talk-in on the 147.90/.30 Salt Plains repeater. For more information, write Steven Walz WA5UTO, Box 222, Cherokee OK 73728, or phone (405)-596-3487.

MARSHALL MI
AUG 26

The fifth annual Trunk 'n' Trailer Bash will be held on Saturday, August 26, 1984, from 7:00 am to 3:00 pm, at the Calhoun County Fairgrounds, Michigan Avenue (I-94 and I-69), Marshall MI. Donations are $1.50 in advance (until August 15th) and $2.00 at the gate; ten-pack tickets in advance are $10.00. Trunk sales spaces are $3.00 each, 10-foot booths are $5.00 each (limited tables available for $5.00 each), and on-site overnight camping is $5.00. Snacks and free parking will be available. Talk-in on the 145.35 repeater (down 600) and 146.52 simplex. For more information, send an SASE to Earl Goodrich K8UCQ, 117 East Michigan Avenue, Marshall MI 49068, or phone (616)-781-5555.

SEWELL NJ
AUG 26

The Gloucester County ARC will sponsor the GCARC 25th Anniversary Ham/Comp Fest on August 26, 1984, from 8:00 am to 4:00 pm, at the Gloucester County College, Sewell NJ. Admission is $2.00 in advance and $2.50 at the door; tailgating is $3.00 per space. Food, facilities, and a shuttle bus from the parking area to the hamfest will be available. Features will include seminars, contests, computer demonstrations, a flea market, and commercial displays. This will be the official VEC testing center for testing Novice through Extra. There will be 610 forms available for morning and afternoon testing and no pre-registration is necessary. Talk-in on 146.52, 147.78/.18, and 223.36/224.96. For further information and reservations, contact Milt Goldman K3WIL, 801 Crown Point Road, Westville NJ 08093, (609)-456-0500, or John M. Fisher K2JF, PO Box 370, Pitman NJ 08071, (609)-589-2318.

HAMPTON IA
AUG 26

The Iowa 75-Meter Net will sponsor a hamfest and picnic on August 26, 1984, in the WKW Park, one mile north of Hampton, off Highway 65. There will be a potluck dinner at noon. Talk-in on 147.15/.65 (Mason City repeater). For more information, contact Philip D. Brown WD0FWB, 1459 3rd Street SE, Mason City IA 50401, or Lovelle Pedersen WB0JFF, 2327 W. Reinbeck Road, Hudson IA 50643.

LEBANON TN
AUG 26

The Short Mountain Repeater Club will sponsor the Lebanon Hamfest on Sunday, August 26, 1984, at Cedars of Lebanon State Park, US Highway 231, Lebanon TN. There will be outdoor facilities only and exhibitors must bring their own tables. Food and drink will be available. Talk-in on 146.31/146.91. For further information, contact Morris Duke W4WXQ, 210 Dispayne Drive, Donelson TN 37214.

DANVILLE IL
AUG 26

The Vermilion County Amateur Radio Association will hold its annual hamfest and flea market on Sunday, August 26, 1984, from 6:00 am to 3:00 pm, at the clubhouse in Harrison Park West, Danville IL. Tickets are $1.00 in advance and $1.50 at the gate. Talk-in on 146.22/.82 and .52 (KB9GS repeater). For more information, contact John Cunningham WA9WJG, Box RY, Perrysville IN 47974, (317)-793-4444, or Joe Mayer KB9GS, 613 E. Kelly Avenue, Box 356, Westville IL 61883, (217)-267-2946.

ST. CHARLES MO
AUG 26

The St. Charles Amateur Radio Club will hold Hamfest '84 on August 26, 1984, at the St. Charles City Hall Complex. General admission is $1.00. The Harvester Lions will provide the barbeque. Riverfront Park and the historic south Main Street area are just a few blocks away. Talk-in on 146.07/.67 and .52 simplex. For more information, contact Ron Ochu KO0Z, 1914 West 5th Street, St. Charles MO 63301.

LARAMIE WY
SEP 7-9

The Northern Colorado ARC, the University of Wyoming ARC, and the Shy-Wy ARC will jointly sponsor the fifth annual High Plains Ham Roundup on September 7-9, 1984, at the Yellow Pine Campground in the Medicine Bow National Forest (35 miles west of Cheyenne). There are no registration fees except for a modest Forest Service charge for campers. Saturday's schedule will include a campfire cookout and bring-your-own covered-dish extravaganza (barbecued hamburgers and liquid refreshments provided), with sing-along music and entertainment by regional talent. Also on Saturday will be a giant tailgate swapfest, a transmitter hunt, and technical displays. Talk-in on .22/.82 and .25/.85. For further information, write Jack Hayes W7CGK, 1321 E. 22 Street, Cheyenne WY 82001.

UNIONTOWN PA
SEP 8

The Uniontown Amateur Radio Club will hold its 35th annual Gabfest on the Saturday after Labor Day, September 8, 1984, on the club grounds located on the Old Pittsburg Road, just off Route 51 and the 119 bypass, Uniontown PA. Registration is $3.00 each or 2 for $5.00. There will be free parking, free coffee, and a free swap and shop with registration. Refreshments will be available. Talk-in on 147.645/.045 and 144.57/.17. For further information, contact UARC Gabfest Committee, c/o John T. Cermak WB3DOD, PO Box 433, Republic PA 15475, or phone (412)-246-2870.

WINDSOR ME
SEP 8

The Augusta Emergency Amateur Radio Unit will sponsor the 1984 ARRL-sanctioned Windsor Hamfest on Saturday, September 8, 1984, at the Windsor Fairgrounds, Windsor ME. The gate donation is still $1.00 and camping will be available on Friday and Saturday nights. Features will include a flea market, programs, speakers, commercial distributors, light meals, and the traditional Saturday bean and casserole supper. Talk-in on the 146.22/.82 repeater. For further information, contact Don Hanson N1AZH, RFD #2, Box 3678, Greene ME 04236, or phone (207)-946-7557.

SAN ANGELO TX
SEP 8-9

The San Angelo Amateur Radio Club will hold CEN TEX HAMFEST '84 on September 8-9, 1984, in the San Angelo Convention Center. Tickets are $5.00 in advance and $6.00 at the door. Hours for Saturday are noon to 6:00 pm and for Sunday, 8:00 am to 2:00 pm. Special events for the ladies include a Saturday afternoon tour of Fort Concho and Old San Angelo. There will be seminars and group meetings Saturday afternoon and Sunday morning, and a reception for dealers followed by a social hour for amateurs on Saturday night. Talk-in on 146.34/.94. For pre-registration or hotel/motel accommodations, write CEN TEX HAMFEST '84, PO Box 3751, San Angelo TX 76902.

MELBOURNE FL
SEP 8-9

The Platinum Coast Amateur Radio Society will hold its 19th annual hamfest and indoor swap-and-shop flea market on September 8-9, 1984, at the Melbourne Auditorium. Admission is $3.00 in advance and $4.00 at the door. Swap tables are $10.00. There will be food and plenty of free parking available, as well as awards, forums, and meetings. Talk-in on .25/.85 and .52/.52. For reservations, tables, and more information, write PCARS, PO Box 1004, Melbourne FL 32901.

TORRINGTON CT
SEP 9

The CQ Radio Club will hold its hamfest on Sunday, September 9, 1984, from 8:00 am to 4:00 pm, at the Torrington Retirees Drop-In Center, East Albert Street. Admission is $2.00, tables are $7.00, and the fee for tailgating is $5.00. Talk-in on 146.05 and 147.24. For more information, write Donald D. Taylor KA1GKJ, PO Box 455, Watertown CT 06795.

MONETT MO
SEP 9

The Ozarks Amateur Radio Society will hold the 3rd annual Ozarks Amateur Radio Club Congress and Swapfest on Sunday, September 9, 1984, beginning at 11:00 am, at the Monett City Park, junction of highways US 60 and MO 37, Monett MO (between Springfield and Joplin). There is no

admission charge and no charge for swap space (available on a first-come, first-serve basis). The buffet dinner begins at 1:00 pm (bring a single covered dish and share in the feast). Talk-in on the 146.37/.97 repeater and 7.250 MHz. For more information, contact the Ozarks Amateur Radio Society, Box 327, Aurora MO 65605.

CARTERVILLE IL
SEP 9

The Shawnee Amateur Radio Association will hold its 28th annual hamfest on September 9, 1984, at the John A. Logan Junior College Campus, Route 13 west, Carterville IL (6 miles east of Carbondale). Admission is $3.00 and flea-market tables are free. Activities will include forums, ladies events, and lunch served on the campus. There will be camping available across the road, motels nearby, and plenty of free parking. Talk-in on 3.925 from 8:00 am to 9:00 am and on 146.25/.85. For more information, phone Bill Johnson W9ERI at (618)-457-7586.

GRAND RAPIDS MI
SEP 15

The Grand Rapids Amateur Radio Association, Inc., will hold its annual Swap and Shop on Saturday, September 15, 1984, beginning at 8:00 am, at the Hudsonville Fairgrounds. There will be dealers, a concession, an indoor sales area, and an outdoor trunk-swap area. Talk-in on 146.16/.76. For more information, write Grand Rapids Amateur Radio Association, Inc., PO Box 1248, Grand Rapids MI 49501.

PEORIA IL
SEP 15–16

The Peoria Area Amateur Radio Club will hold its Peoria Superfest '84 on September 15–16, 1984, at the Exposition Gardens, W. Northmoor Road, Peoria IL. The gate opens at 6:00 am and the Commercial Building at 9:00 am. Admission is $3.00 in advance and $4.00 at the gate; children under 12 will be admitted free. Activities will include amateur-radio and computer displays, a huge flea market, a free bus to Northwoods Mall on Sunday, and a Saturday-night informal get-together at Heritage House Smorgasbord, 8209 N. Mt. Hawley Road, Peoria IL. There are full camping facilities on the grounds. Talk-in on 146.16/.76 (W9UVI). For reservations and more information, send an SASE to Superfest '84, PO Box 3461, Peoria IL 61614.

MT. CLEMENS MI
SEP 16

The L'Anse Creuse Amateur Radio Club will hold their 12th annual swap and shop on Sunday, September 16, 1984, from 9:00 am to 3:00 pm, at the L'Anse Creuse High School, Mt. Clemens MI. Take I-94 eastbound to the Metropolitan Parkway exit; then take the Metropolitan Parkway to Crocker; turn left on Crocker to Reimold and then right on Reimold to the last school, L'Anse Creuse High School. Admission is $1.00 in advance and $2.00 at the door. FCC representatives will be there, as well as plenty of new and used gear. There will be lots of food and parking. Talk-in on 147.69/.09 and 146.52. For more information, send an SASE to Maurice Schietecatte N8CEU, 15835 Touraine Court, Mt. Clemens MI 48044, or phone (313)-286-1843.

NEW KENSINGTON PA
SEP 16

The Skyview Radio Society will hold its annual hamfest on Sunday, September 16, 1984, from noon until 4:00 pm, at the club grounds on Turkey Ridge Road, New Kensington PA. Registration fee is $2.00 and vendors' fees are $4.00. Awards will be presented. Talk-in on .04/.64 and .52 simplex.

AUGUSTA GA
SEP 16

The Amateur Radio Club of Augusta will hold its annual hamfest on September 16, 1984, at Julian Smith Casino Park. Tickets are $1.00 each, 6 for $5.00, or 13 for $10.00. Features will include a flea market in the parking lot, a barbecue, refreshments, dealers, entertainment, and on Saturday evening, a hospitality room at Ramada Inn West, Washington Road, rooms 108–110. Talk-in on 145.49 – 600. For more information, send an SASE to D. F. Miller WB4YHT, Hamfest Chairman, 4505 Shawnee Road, Martinez GA 30907, or call 1-(404)-860-3700.

GRAYSLAKE IL
SEP 22–23

The Chicago FM Club will sponsor Radio Expo '84 on Saturday and Sunday, September 22–23, 1984, at the Lake County Fairgrounds, Rtes. 120 and 45, Grayslake IL. Tickets, good for both days, are $3.00 in advance and $4.00 at the gate. The flea market will open at 6:00 am and the exhibits will open at 9:00 am. There will be a giant outdoor flea-market area. Reserved indoor flea-market tables are available for $5.00 per day. Other features will include seminars, technical talks, ladies' programs, and free parking and overnight camping. Talk-in on 146.16/.76. For more information, send an SASE to Radio Expo '84, Box 1532, Evanston IL 60204, or phone (312)-582-6923.

VIRGINIA BEACH VA
SEP 22–23

The 1984 ARRL Roanoke Division Convention and 9th annual Amateur Radio/Computer Fair will be held on Saturday and Sunday, September 22–23, 1984, from 9:00 am to 5:00 pm both days, at the Virginia Beach VA Pavilion. Admission for both days is $4.00 in advance and $5.00 at the door. Flea-market tables are $5.00 for one day and $8.00 for both days. Features include dealers, special displays, forums, computer equipment, a giant flea market, free XYL bingo, and movies for the kids. For tickets and more information, write Jim Harrison N4NV, 1234 Little Bay Avenue, Norfolk VA 23503, or call (804)-587-1695.

WICHITA FALLS TX
SEP 22–23

The annual Wichita Amateur Radio Society Tornado Alley Hamfest will be held on Saturday and Sunday, September 22–23, 1984, at the National Guard Armory, Wichita Falls TX. The hours on Saturday will be 9:00 am to 5:00 pm and on Sunday, 9:00 am to 2:00 pm. Registration will begin at 9:00 am both days and is $4.00 per person in advance and $5.00 at the door. Pre-registration closes Wednesday, September 19th. There will be a large indoor flea market and tables are $3.00 each. Features will include commercial dealers' displays, computer dealers and demonstrations, ladies' activities, and special events. If you wish to take an amateur exam, send FCC form 610 to the hamfest address prior to August 17, 1984. A concession stand will be open both days. Talk-in on 146.34/.94, 147.75/.15, 449.30/444.30, and 449.20/444.20. For more information or pre-registration, contact WARS Hamfest, PO Box 4363, Wichita Falls TX 76308.

GAINESVILLE GA
SEP 23

The 11th annual Lanierland ARC Hamfest will be held on September 23, 1984, beginning at 9:00 am, in the Holiday Hall at Holiday Inn, Gainesville GA. There will be free tables and an inside display area for dealers reserving in advance. A large parking lot will be available for the free flea market. Other features will include a left-foot CW contest, a ladies' country store, and many activities. Talk-in on 146.07/.67. For more information and reservations, contact Phil Loveless KC4UC, 3594 Thompson Bend, Gainesville GA 30506, or call (404)-532-9160.

WICHITA KS
SEP 23

The Wichita Hamfest will be held on September 23, 1984, at Camp Hiawatha, 1701 West 51st Street North, Wichita KS 67204. Features will include a flea market, programs, and commercial exhibits. For more information, contact Norm Tramba WA0HWH, 340 S. 1st, Clearwater KS 67026, or phone (316)-584-6425.

WILLIMANTIC CT
SEP 23

The Natchaug Amateur Radio Association will hold its annual giant flea market on Sunday, September 23, 1984, from 9:00 am to 4:00 pm, at the Elks Home, 198 Pleasant Street (off Route 32), Willimantic CT. Admission is $2.00 and children under 16 will be admitted free. Tables are $5.00 in advance and $7.00 at the door (dealers will be admitted at 8:00 am). Food, drinks, and free parking will be available. Talk-in on the 147.30/147.90 repeater and .52 direct. For more information, contact Ed Sadeski KA1HR, 49 Circle Drive, Willimantic CT 06226, or phone (203)-456-7029.

ADRIAN MI
SEP 23

The Adrian Amateur Radio Club will hold its 12th annual hamfest on Sunday, September 23, 1984, at the Lenawee County Fairgrounds, Adrian MI. Because tables are limited, reservations (by check or cash) must be made no later than September 15, 1984. For more information, tickets, or tables, contact Adrian Amateur Radio Club, PO Box 26, Adrian MI 49221.

HAMILTON ONT CAN
OCT 6

The Hamilton Amateur Radio Club, Inc., will hold its 2nd annual flea market on Saturday, October 6, 1984, beginning at 8:30 am, at Marritt Hall, Ancaster Fairgrounds, 625 Highway 53 East. Admission is $2.00. Flea-market vendors' 8-foot tables are $4.00 plus admission and commercial vendors' 8-foot tables are $10.00 with admission included. There will be room for 150 vendors and setup will be from 7:00 am to 8:30 am. Coffee, soft drinks, and sandwiches will be available. Talk-in on 146.16/146.76 (VE3NCF). For space reservations, contact HARC Flea-Market Committee, PO Box 253, Hamilton ONT L8N 3C8. For more information, contact Stan VE3GFE on VE3NCF.

SANTA FE NM
OCT 7

The Northern New Mexico Hamfest will be held on October 7, 1984, from 8:00 am to 3:00 pm, at the Terrero Group Shelter, along the Pecos River, east of Santa Fe. Admission is $3.00 for adults and $1.50 for children. Activities will include a tailgate flea market, group meetings, family games, fishing, and picnicking. There will be hot dogs, chips, soft drinks, and coffee available, as well as free Saturday-night camping. Talk-in on local repeaters and .52 simplex. For further information please send an SASE to Northern New Mexico ARC, c/o Bob Norton N5EPA, Route 3, Box 95-15, Santa Fe NM 87501, or call on 3.939 MHz at 0100 UTC.

YONKERS NY
OCT 7

The Yonkers Amateur Radio Club will sponsor the Yonkers Electronics Fair and Giant Flea Market on Sunday, October 7, 1984, from 9:00 am to 4:00 pm, rain or shine, at the Yonkers Municipal Parking Garage, corner of Nepperhan Avenue and New Main Street, Yonkers NY. Admission is $2.00 each and children under 12 will be admitted free. Gates will be open to sellers at 8:00 am and there will be a $6.00 admission per parking space which will also admit one (bring your own tables). Refreshments, free parking, and sanitary facilities will be available, as well as unlimited free coffee. There will be live demonstrations all day and a giant auction at 2:00 pm. Talk-in on 146.265T/146.865R or .52 direct. For more information, write YARC, 53 Hayward Street, Yonkers NY 10704, or phone (914)-969-1053.

PARAMUS NJ
OCT 14

The Bergen ARA will hold a Ham Swap 'n' Sell on October 14, 1984, from 8:00 am to 4:00 pm, at Bergen Community College, 400 Paramus Road, Paramus NJ. There will be tailgating only; bring your own table. Admission for sellers is $4.00; buyers will be admitted free. Thousands of spaces will be available. Talk-in on .79/.19 and .52. For more information, write Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855, evenings only.

HAM HELP

Tornado and/or thunderstorm-detection article from very early *73* magazine needed. Will be happy to pay any reasonable copy costs. Will also pay copy costs for any other electronics articles on the same subject.

Jim Weir WB6BHI
13281 Grass Valley Ave.
Grass Valley CA 95945

I am looking for the service manual for the NCX-3, or schematics for the power supply for the NCX-3 (by National).

Dennis Bosley WA1URS
186 Hickam Drive
Loring AFB ME 04751
(207)-328-4432

Wanted: Atwater Kent speaker.

Q. R. Galbraith K5TVC
4303 Kingsway Drive
Farmington NM 87401

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

THE POSTMAN GETS RELIEF

This year's FUN! Poll, the fourth annual installment, saw our postman get some much needed rest. The acquisition of PO Box 73 and the use of electronic mail meant that my friendly mail carrier didn't have to suffer this year with a heavy mail sack and icy sidewalks.

Response levels were down this time. In 1983, 1,190 hams wrote in to express their views. This year, 987 of you mailed or electronically transmitted your responses. Still, that's a significant amount of mail to open, read, and tabulate. It took four people to accomplish the manual work and five computers (a TRS-80 Model III, an Apple IIe, an Atari 400, and a TRS-80 Model 100) to manipulate the numbers. Mainframe computers in Columbus, Ohio, and McLean, Virginia, trahsmitted the electronic responses to FUN! HQ.

Here's what you had to say.

ELEMENT 1 BACKGROUND

1) Sex:
A) Male—97%
B) Female—3%
No surprise here.

2) Age:
A) 15 or below—3%
B) 16–21—5%
C) 22–39—27%
D) 40–59—38%
E) 60 or above—27%
The graying of amateur radio. These numbers are heading upward with each poll.

3) License class:
A) Novice—8%
B) Technician—12%
C) General—31%
D) Advanced—39%
E) Extra—10%
Somehow, I expected more Extras to respond.

4) Number of years licensed:
A) 1 year or less—2%
B) 1–5 years—31%
C) 6–10 years—13%
D) 11–20 years—32%
E) 21 years and up—22%
Just about the same statistics as last year.

5) Do you have a new (post-March '78) call?
A) Yes—52%
B) No—48%
The "yesses" break the 50% mark for the first time.

6) How many hours a week do you devote to amateur radio?
A) 0–1 hour—8%
B) 2–5 hours—35%
C) 6–10 hours—33%
D) 11–20 hours—19%
E) 21 hours or more—5%
Activity seems down a bit from last year.

7) Which HF band do you use most?
A) 80–75 meters—17%
B) 40 meters—25%
C) 20 meters—21%
D) 15 and/or 10 meters—24%
E) Don't operate HF—13%
About the same numbers as last year. Next time, we'll include the WARC bands.

8) Which VHF-UHF band do you use most?
A) 6 meters—2%
B) 2 meters—74%
C) 220 MHz—6%
D) 420 MHz and/or up—4%
E) Don't operate VHF-UHF—14%
Also about the same.

9) Which mode do you use most?
A) SSB—42%
B) CW—18%
C) FM—31%
D) RTTY—5%
E) Other—4%
Same again.

10) How much money have you spent on amateur radio within the past year? (Include QSL expenses, magazine subscriptions, club dues, and other incidental expenses.)
A) 0–$250—51%
B) $251–$500—30%
C) $501–$1,000—13%
D) $1,001–$2,500—4%
E) $2,501 and up—2%
The economy is up, but ham sales are still down.

ELEMENT 2 SOCIAL CHARACTERISTICS

11) Has amateur radio influenced your career choice?
A) Greatly—24%
B) Somewhat—22%
C) Not at all—54%
Less of an influence than last year.

12) Should the ARRL get rid of the DXCC Honor Roll?
A) Yes—61%
B) No—39%
Sending a message to Newington.

13) Politically, how would you define yourself?
A) Conservative—51%
B) Middle-of-the-road—46%
C) Liberal—3%
We're getting more conservative.

14) Should the ARRL get rid of the DX Century Club?
A) Yes—51%
B) No—49%
We're split.

15) How old were you when you first became a ham?
A) 15 or below—13%
B) 16–21—50%
C) 22–39—21%
D) 40–59—11%
E) 60 or above—5%
No significant change from last year.

16) Should the FCC increase the speeds on amateur CW examinations?
A) Yes—13%
B) No—87%
Shaky fists.

17) Do you own a home computer?
A) Yes—55%
B) No—45%
We've broken the 50-percent barrier! Who would have thought it, only a few years ago?

18) Do you think hams, compared to computer hobbyists, are:
A) More technically inclined in their hobby—26%
B) Less technically inclined in their hobby—38%
C) About equally skilled in their hobby—36%
Not much change here.

19) Do you think that home computing is siphoning people (including youngsters) away from amateur radio?
A) Yes—60%
B) No—40%
If you don't believe this, you're kidding yourself.

20) Will the volunteer exam system increase cheating?
A) Yes—45%
B) No—55%
Not exactly a vote of confidence.

21) Should volunteer examiners be allowed to collect a fee to help defray expenses?
A) Yes—71%
B) No—29%
And the FCC agrees.

22) Has ham radio helped to make you a better person?
A) Yes—75%
B) No—25%
That's nice.

23) Should ham licenses have a minimum age requirement?
A) Yes—45%
B) No—55%
Oh, pooh to you 45 percenters. You want to kill the hobby, or what?

24) Should hams be subject to periodic retesting?
A) Yes—6%
B) No—94%
Ah, we all remain confident in our skills.

ELEMENT 3 OPERATING HABITS

25) If the users were restricted to data communication only (no phone or CW operation), would you be in favor of a no-code 220-MHz, digital-class license?
A) Yes—43%
B) No—57%
I guess 220 is too busy as it is.

26) Would you be in favor of a no-code 220-MHz, digital-class ticket if it permitted phone operation in addition to data transmission?
A) Yes—6%
B) No—94%
I hear you, I hear you!

27) Have you ever used a personal computer in connection with your amateur-radio activities?
A) Yes—70%
B) No—30%
Up 11 percent from last year. A very good sign.

28) Is it time to completely deregulate amateur radio by having the FCC turn over all responsibility for ham operation to the amateur community?
A) Yes—55%
B) No—45%
Exactly the same numbers as last year. I guess we still don't totally trust ourselves.

29) What do you think of people who view pay-television services with MDS converters and satellite dishes that are not approved by broadcasters?
A) They're skunks—37%
B) They're within their rights—63%
Okay.

30) Should we get rid of, or reduce in size, the CW subbands?
A) Yes—61%
B) No—39%
No big change here.

31) Do you think DX nets have a place in ham radio?
A) Yes—34%
B) No—66%
Let's dump 'em.

32) Do you think nets in general have a place in ham radio.
A) Yes—70%
B) No—30%
A liberal attitude.

33) The next time a ham operates from space, which band should he/she use?
A) 2 meters—12%
B) 220 MHz—4%
C) 450 MHz—36%
D) An even higher band—12%
E) Shouldn't bother to operate—36%
Says a lot about the state of 2 meters and amateur radio in general.

34) If, while tuning across a band, you heard a net called "Jammers International" in progress, would you:
A) Jam it—8%
B) Ignore it—13%
C) Complain to the FCC or some other organization—63%
D) Listen—15%
E) Join it—1%
A sensible attitude, I think.

35) If required, could you solidly copy CW at the speed at which you were licensed?
A) Yes—70%
B) No—30%
Yeah, sure.

36) If required, could you pass the FCC theory test for your license class?
A) Yes—72%
B) No—28%
Uh, huh.

37) Have you ever purposely operated in an amateur subband you weren't licensed to use?
A) Yes—10%
B) No—90%
Whew.

38) Do you think the ARRL affects amateur radio in a positive manner?
A) Yes—37%
B) No—63%
Those figures need some work.

39) Do you ever speak to foreign, non-English-speaking hams in their own language?
A) Always—2%
B) Sometimes—16%
C) I attempt it—25%
D) Rarely—5%
E) Never—52%
No major change from last time.

40) Do you feel yourself competent to replace the finals in a tube-type rig?
A) Yes—90%
B) No—10%
You pull on the glass part.

41) Do you feel yourself competent to replace the finals in a transistor-type rig?
A) Yes—74%
B) No—26%
A handy talent, to be sure.

42) Do you solder together your own coax connectors?
A) Yes—95%
B) No—5%
Good.

43) Is your antenna system mounted on your house or a tower?
A) House—93%
B) Tower—7%
I don't have room for a tower, either.

44) Have you ever designed your own antenna?
A) Yes—4%
B) No—96%
The gremlins crept into this question. I don't know who was responsible for leaving it off the response form, but whoever you are, I sentence thee to two-dozen lashes with a section of RG-58/U (better

make that RG-8/U). By the way, I've never designed a skyhook, either.

45) What do you think of contesting?
A) Great—10%
B) Good—25%
C) Okay—11%
D) Don't like it—23%
E) Despise it—31%
No significant change here.

46) What do you think of DXing?
A) Great—35%
B) Good—27%
C) Okay—12%
D) Don't like it—12%
E) Despise it—14%
Or here.

47) What do you think of repeaters?
A) Great—35%
B) Good—10%
C) Okay—35%
D) Don't like them—12%
E) Despise them—8%
Or here.

48) What do you think of traffic handling?
A) Great—10%
B) Good—29%
C) Okay—29%
D) Don't like it—11%
E) Despise it—21%
Or here, either (ho-hum).

49) If you heard an emergency net in progress, would you immediately join in and offer your services?
A) Yes—64%
B) No—36%
I say, stay away until you're called for.

50) Should all hams be required to join some type of national amateur-radio organization?
A) Yes—11%
B) No—89%
The independent spirit lives.

SELECTED COMMENTS

I hope they don't get a minimum age requirement or I'll probably be off the air for a few years (age 14).—**KC0XK**

This is the first time I have participated in a survey like this. Tnx.—**K9QWJ**

Hey! Why no provocative questions this year? Re question 23, there should be a maximum age—**AF2M**

Most CW operators on a DXpedition operate at a high rate of speed—35 to 40 wpm. I think this adds to the confusion. People "think" they worked him instead of knowing they did. It also makes it hard for the 20-wpm-and-under people to work the station.—**N4TL**

I'm sorry to see very few questions about the ARRL. . . More attention should be given [by the League] to young people; less money wasted by the big shots in Newington and less control of power by the old, biased Board of Directors.—**N4CXF**

At age 74 I am now an SWL of ham bands. Do have gear for two complete stations, but the personal thrill is gone.—**W8KBH**

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

You know, sometimes the weather can be vicious! I mean, here I am in May, writing a column for August, and the Baltimore weather is as hot and muggy as any summer day. Oh well, my sinuses do not appreciate that!

I bring this up to tell the tale of how I escaped the heat by retreating to my basement, an unfinished subterranean recess which is naturally cool and contains boxes and boxes of material yet unpacked from our move last year. In one of them I found a whole bunch of letters from some of you, many of which remain unanswered. I shall share some of them, along with some recent arrivals, with you all today.

An article in a recent issue of *Scatter*, the journal of the Southern Counties (CA) Amateur Teleprinter Society, raises an interesting point. With all of the discussion about video and computer RTTY setups, we tend to overlook the many amateurs who continue to use mechanical teleprinters. Years ago, we used to terminate each line with two carriage returns, one line feed, and two letters characters, i.e., CR-CR-LF-LTRS-LTRS. While this may be overkill and may double-space for the station that inserts a line feed for each carriage return, a truncated CR-LF-LTRS-LTRS would still be very appropriate and allow those with mechanical-type baskets the luxury of copying the beginning of each line.

Let's go a step further and look at the variety of ways in which RTTY stations can communicate, from direct to through a repeater. We recognize that transmission delays through a repeater may chop a second or two off the front of a transmission and that mechanical clutches may need a character or two to come up to speed. Further, garbage may have crept in and left the carriage in the middle of the current line. What is needed is a protocol to ensure that the beginning of each transmission is received and that each line is received as well.

One such procedure would be to activate the transmitter, then either pause with a blank carrier for a few seconds or send a timing signal composed of either BLANKS (Murray code 00000) or LETTERS (Murray code 11111). Follow this with one carriage return, one line feed, two LETTERS, and then send each line of the transmission. Follow each line with the same CR-LF-LTRS-LTRS sequence. When you are through, send another end-of-line sequence to place the printer on a blank line so that garbage will not cause the printer to overtype your just-sent data, and turn off the transmitter.

Now, moving right along, regards to Tom Clancy N8RC. Tom is living up in Frederick, Maryland, quite a ways from here, and is looking to return to RTTY after years away. Come on in, Tom, the techniques may have changed, but it's more fun than ever! Let me know how you do.

Theodore E. Deusner of Kennewick, Washington, asks about receivers for RTTY reception. One of the ones he asks about is the venerable Hammarlund HQ-180. This receiver, or any other one which is stable enough to receive SSB, should be fine for RTTY. If the receiver has a bandpass which prevents generation of the "common" RTTY audio tones, in the 2000-Hz range, it is possible to use alternate tones that would still work but would fall within the "standard" SSB bandpass. Good luck with the efforts.

Another note here is from Bill Pascale W6JED of Oroville, California. Bill has been a fan of the column since his interest peaked on RTTY, and he states that he enjoys the column. So do I, Bill, and I especially enjoy hearing from you all; thanks for the letter.

A letter from Dick Chambers WA4GKR in Wilmington, North Carolina, asks a question that is on many an amateur's mind. He wants to know which features of modern RTTY terminals are desirable, and which of a series of named units is the "best" in several of these areas. Some of the features Dick mentions are the ability to send and receive CW, ASCII, and various speeds of Murray, as well as split screen, buffers, automatic screen formatting with word wrap and editing, and the like. Well, Dick, my first response is to state that RTTY is a mode that is, to me, as captivating running an old Teletype® Model 15 as it is with a video terminal. So, I am not really sure which of these, or other, features will be important to *you*! I would advise you to just try to get onto RTTY with as little outlay as possible, enjoy the mode for a while, and then upgrade your station with those features that you have heard about and seem important to you.

The problem with rating the various terminals, Dick, is that I have little more information than you do. Like you, I read the ads and the press releases published in the various journals. I have also written to most of the manufacturers for specific information and, almost without exception, have received little in the way of concrete information. If I have been given access to a piece of equipment, you can be sure I have written all I could find out about it while running it through its paces. But those events have been few and far between. Most manufacturers have not even supplied information over that in the ads; some have promised material and never come through. If I could build some sort of comparison, I would, but I hesitate to build it on only the claims gleaned from advertisements. Hope this helps.

Now, Edward Stetzer K2ZBA writes a note asking about one of the units I did review, the Microlog 6800. Edward, I had that unit up and operating through the courtesy of Microlog for about a week and was thoroughly impressed. I reviewed the terminal in the February and March, 1981, RTTY Loop columns in *73*. I am sending Edward some of that information; others who are interested are invited to look at those issues of the column. I have not had the opportunity to see any of the more recent stuff coming out of Microlog, but with the solid base of the original 6800, I feel sure they are moving onward and upward.

Years ago, I had an old tube-type, rack-mounted, and very heavy demodulator made by the Northern Radio Corporation. This came to mind with the receipt of a letter from Joe Sabo KB7NU of Bothell, Washington. Joe writes that he is the service manager at Northern Radio, in Redmond, Washington, manufacturers of marine SSB equipment. The Northern Radio company that manufactured the RTTY equipment, much of it for the military, was a different company. Nonetheless, Joe's company receives about five to ten calls a month asking for parts or service for that old, but venerable, equipment. Joe points out that the RTTY manufacturer Northern Radio was sold to RF Harris, who later sold the parts inventory to QEI. They may still have a limited supply of parts for old Northern RTTY equipment. You might address any questions to QEI, Inc., 60 Faden Road, Springfield, New Jersey 07804. Thanks for the information, Joe.

Jim Pruitt WA7DUY from Lewiston, Idaho, is another ham interested in putting his CoCo onto RTTY. Once again, Jim, the best source for CoCo software that I have seen is Clay Abrams, 1758 Comstock Lane, San Jose, California 95124. Clay features a variety of CoCo-compatible RTTY software and should have a disk version available soon. Right, Clay?

The third issue of basic RTTY tips is now available and may be obtained by sending $2.00 to me at the address at the top of this column. Of course, the first two issues remain available, and I shall be including a listing of what is available for those who missed previous issues. For those who came in late, much of this information was covered here in RTTY Loop during the first few years of the column and is being offered as a service to those newcomers who may have missed it.

Some hardware is on the books for next month—that and more, you never can tell, here in RTTY Loop.

HAM HELP

An American priest who has been a missionary in India for many decades wishes to set up a ham-radio station in a boys' orphanage. It would be used for educational purposes and so that he can contact his many benefactors in the United States, Canada, and England. Donations of working ham-radio equipment or donations of funds to purchase such equipment are being requested on his behalf. Please address:

Rev. Father A. Seeber S.D.B.
The Citadel
18 Landon's Rd
Madras 600 010
India

Wanted at a reasonable price: two i-f transformers for an R-392 receiver and the following tubes; twelve 6AJ5s, four 26A6s, two 26C6s, two 26D6s, and two 26A7s.

Johnny E. Carr WA4FCC
Route 2
Rockmart GA 30153

I am hoping to get in touch with someone regarding programming an EPROM for a paging encoder manufactured by Zetron in Bellevue, Washington.

Charles L. Kelsey WB2EDV
RD #2, Box 63, Elmwood Avenue
Mayville NY 14757

SATELLITES

Amateur Satellite Reference Orbits

RS-5		RS-6		RS-7		RS-8		Date
UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	
0055	208	0003	201	0126	217	0115	208	1
0050	208	0146	228	0116	216	0112	209	2
0045	209	0131	226	0106	215	0109	210	3
0039	209	0115	224	0057	214	0107	210	4
0034	209	0100	221	0047	213	0104	211	5
0029	209	0045	219	0037	212	0101	212	6
0023	209	0029	217	0028	211	0058	213	7
0018	210	0014	215	0018	210	0055	214	8
0012	210	0157	242	0008	210	0052	214	9
0007	210	0142	240	0158	239	0050	215	10
0002	210	0126	237	0148	238	0047	216	11
0156	240	0111	235	0139	237	0044	217	12
0151	241	0056	233	0129	236	0041	218	13
0145	241	0040	230	0119	235	0038	219	14
0140	241	0025	228	0110	234	0035	219	15
0135	241	0009	226	0100	233	0033	220	16
0129	241	0153	253	0050	232	0030	221	17
0124	241	0137	251	0041	231	0027	222	18
0119	242	0122	248	0031	231	0024	223	19
0113	242	0106	246	0021	230	0021	223	20
0108	242	0051	244	0012	229	0018	224	21
0103	242	0036	241	0002	228	0016	225	22
0057	242	0020	239	0152	257	0013	226	23
0052	243	0005	237	0142	256	0010	227	24
0047	243	0148	264	0132	255	0007	228	25
0041	243	0133	262	0123	254	0004	228	26
0036	243	0117	260	0113	253	0001	229	27
0031	243	0102	257	0103	253	0158	260	28
0025	244	0046	255	0054	252	0155	261	29
0020	244	0031	253	0044	251	0153	262	30
0015	244	0016	250	0034	250	0150	262	31
0009	244	0000	248	0025	249	0147	263	1
0004	244	0143	275	0015	248	0144	264	2
0158	275	0128	273	0005	247	0141	265	3
0153	275	0113	271	0155	276	0138	266	4
0147	275	0057	268	0145	275	0136	267	5
0142	275	0042	266	0136	274	0133	267	6
0137	275	0026	264	0126	274	0130	268	7
0131	275	0011	262	0116	273	0127	269	8
0126	276	0154	289	0107	272	0124	270	9
0121	276	0139	287	0057	271	0121	271	10
0115	276	0124	284	0047	270	0119	271	11
0110	276	0108	282	0038	269	0116	272	12
0105	276	0053	280	0028	268	0113	273	13
0059	277	0037	277	0018	267	0110	274	14

HAM IN SPACE, TAKE 2

Tony England W8ORE may become the second astronaut to carry amateur radio into space. A joint AMSAT/ARRL proposal to NASA asks that Tony be allowed to operate on his upcoming 51F/Spacelab-2 mission, scheduled to fly during March of 1985. The proposal calls for more equipment to be carried aloft than was present on Owen Garriott W5LFL's ground-breaking flight, including automatic systems that will provide unattended operation.

UOSAT-2 RESPONDS

After more than ten weeks of silence, the sweet sound of telemetry greeted workers at the University of Surrey command station. After numerous attempts, the 2-meter telemetry beacon (145.825 MHz) sprang to life on May 7, providing valuable insight into the spacecraft's condition.

Thanks to *Amateur Satellite Report* for this month's news.

HAM HELP

I am looking for a manual and/or a schematic for a Drake TR-3.

C. H. Camidge
8-C Roslin St. South
Waterloo, Ont. N2L 2G5
Canada

I am looking for a schematic for a Hallicrafters "Sky Buddy" receiver. *Any* help would be greatly appreciated.

Tom Kennedy K8TK
PO Box 67
Clark Lake MI 49234

I need a schematic for a model CA-1510 signal generator. It was made by Munston Manufacturing, Islip NY, for civil aeronautics use. I will gladly pay copy costs.

John Mock WA4LKW
2860 Gospiel Peace Rd.
Hopkinsville Ky 42240

I am looking for a schematic for a power supply to operate an old war-surplus BG-348-0 receiver. I also need schematics for 1- or 2-transistor QRP rigs and some FT-243 crystals for 40-meter CW.

Billy Suit K4BUF
Route 1 Box 194-1C
Randleman NC 27317

I need a schematic and manual for an Eico-Kit model 430 oscilloscope. I will gladly pay for any copying and mailing costs.

Larry S. Brooks WB8ECV
3185 Bunting Ave.
Grand Junction CO 81504

I am looking for information on windmill manufacturers.

Edward W. Dirksen
10685 Curtis St.
Loma Linda CA 92354

Can anyone help with coils and technical manual/schematic for a Central Electronics exciter CE-10? I will consider your old unit from the junk box as spares for a price, too.

Ragnar Otterstad
Vejdammen 5
DK 2840 Holte
Denmark

Looking for *Modern Radar: Theory, Operation, and Maintenance*, distributed in past by TAB Books. Please state condition and asking price in letter.

Edmund L. Meianson AA1H
Rte #2, Box 510
Thorndike ME 04986

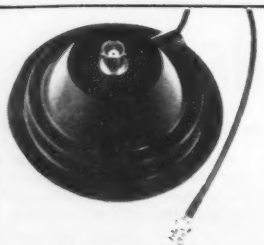
Looking for a Lafayette Radio six-channel crystal-controlled receiver which covers 30-50 MHz FM, in segments of 4 MHz. Would like manual for same, also.

Charles L. Kelsey WB2EDV
RD #2, Box 63, Elmwood Ave.
Mayville NY 14757

I am in need of a Swan transceiver, model 2X. I also need manuals and schematics for the Swan 2X.

John Jackson N3CDG
71 Regent St.
Wilkes Barre PA 18702
(717)-823-3590

UP YOUR ERP



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The magnet mount (part no. 199-445) has 10 feet of small (5/32") co-ax with BNC connector attached and is priced at $15.95 (including shipping by UPS to 48 states).

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Fla. residents add 5% tax, for air UPS add $1.50

The RF PRODUCTS Magnet Mounts are one of the few magnetic antenna mounts available that can be repaired should the co-ax cable be damaged. The co-ax cable connector includes a shrink tubing strain relief for long life at the connector/cable flex point (an RF PRODUCTS exclusive on all cable assemblies).

Eight other models available with three each choice of antenna connectors, co-ax types and transceiver connectors (BNC, 1-1/8-18, 5/16-24 & RG-122U, RG-58A/U, mini 8X & BNC, PL-259, type N).

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Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

THE END OF THE IRC?

Is the International Reply Coupon on the way out? Dr. Vicente Tuason, the Director of Posts at Berne, Switzerland, recommends just that in his article in *Union Postale*. (*Union Postale* is the official publication of the Universal Postal Union, which administers the IRC.) Dr. Tuason cites the complexities of accounting for the International Reply Coupons (IRCs), and the increasing "abuses" in the form of currency speculation in IRCs.

The problem that Dr. Tuason wants to eliminate is exactly the feature of IRCs which makes them so useful in amateur radio and especially DX: IRCs are the best available approximation of a universally-accepted international currency. Since all IRCs are equivalent and can (supposedly) be redeemed in any country in the world, one can transfer funds from one country to another in the form of International Reply Coupons.

It seems that a few entrepreneurs are doing exactly that. In a country with rapid inflation, speculators are buying huge quantities of IRCs at a relatively low cost. They fly these IRCs to Switzerland, with its very stable currency, and, if their timing is right, can sell them to the Swiss Post Office for more than they originally paid! Switzerland, with its liberal banking laws and rock-steady currency, is taking the brunt of the speculating, and hence Dr. Tuason's recommendation that the International Reply Coupons be abolished.

Don't stay awake at night wondering how you're going to get that XU1SS card back without IRCs, however. Dr. Tuason's article recommending the abolition of the IRC appeared in April, 1957. The IRC has survived this and other challenges in the past 30 years, and most likely, will continue to do so for another 30.

Good thing, too, as the IRC plays a major role in DX and would be very difficult to replace. On the other hand, the IRC is one of the least understood aspects of the fine art of QSLing.

Universal Postal Union

To understand the IRC and its role, we must turn to one of the most basic tenets of international mails. When you buy a stamp for an overseas letter, *all* of the money for postage goes to the country sending, or originating, the letter. In this case, the United States Postal Service keeps the dough. The postal service in the destination country which still has to deliver the letter gets nothing. The various postal services argue that every letter will elicit a reply, so the recipient will purchase the stamp for the return letter, that country will get the funds, and the USPS delivers the letter to you for nothing.

This system requires no bookkeeping, leaves each country's postal service to set prices as it sees fit and eliminates delays while countries argue over who pays for what.

Such was the most fundamental concept of the Universal Postal Union (UPU), which was founded in 1874. (Incidentally, the UPU was founded some years after the International Telecommunications Union, and, in fact, was closely patterned after that organization.)

This system of letting each country keep its own international postal receipts worked fine except for one flaw, which was evident from the start. Some writers want to *prepay* the return postage to increase the chances of a reply. If the sender country keeps all the money for both directions, the postal service in the destination country gets nothing. But if you tried to send half of round-trip money to that country, you would have a bookkeeping nightmare.

So about 30 years after the UPU started, a solution to this dilemma was proposed: the International Reply Coupon. Approved by the 64 member countries in the UPU Congress of 1906, the IRC is now pushing 80 years old. And the concept of and need for the IRC remain unchanged.

The way the International Reply Coupon works (officially) is very simple. At any post office (well, almost any post office) you can purchase an International Reply Coupon for $0.65. You can send that IRC to someone in any member country of the Universal Postal Union, which includes just about every country in the world. The recipient can (supposedly) cash the IRC in at his post office for "one or more postal stamps representing the minimum postage for an unregistered letter sent by surface to a foreign country."

In other words, the IRC is good for stamps to mail one letter by surface transportation back to you. If you receive an IRC, you can cash it in at (almost) any post office for the postage stamps to send a surface letter overseas: say $0.30 for a letter to Europe, for example.

Postal authorities in the various countries may, at their option, exchange more than one IRC for airmail postage overseas. This gives rise to the lists in the *Radio Amateur Callbook* and other places for the number of IRCs needed to get an airmail letter back to you. This can range from as little as two IRCs to as many as six!

Note that the post office doesn't have to pay cash for the IRCs, only postage stamps. And the post office can require that you present the letter at the same time as the IRCs so that you can't even take the stamps and sell them for cash.

At least, that's the way the system is supposed to work. In practice, of course, this seldom happens. Instead, International Reply Coupons are a means of transferring small amounts of money from one country to another. IRCs are seldom cashed in because of the unfavorable exchange rate. (Who wants to lose half the money every time one exchanges an IRC for stamps?) The DXer hangs on to any IRCs he receives and uses them the next time he needs IRCs to get a card back, rather than running down to the post office and laying out $0.65 each for new IRCs.

After all, the IRCs are good "indefinitely," so why cash them in? Apparently other users than amateur radio DXers feel that way, as only about half of the IRCs issued each year are redeemed. And that includes the considerable number involved in currency speculation, a problem that continues 30 years after Dr. Tuason's article.

This "extra-postal" use of the International Reply Coupon will not be eliminated. In fact, one of the original justifications for the IRC, back in 1906, was just this service. Since small sums of money are frequently exchanged within a country in the form of postal stamps, the IRC could similarly supplement the international money-order system for very small amounts of money.

Since the IRC is supposed to be a limited form of international currency, it is not surprising that it plays that role in amateur radio. Indeed, most international amateur-radio debts can be settled in IRCs: return postage, award costs, etc. To keep the IRCs circulating, there is a "gray market" for the coupons. Most larger DX clubs and many active QSL managers and DXers collect hundreds and thousands of IRCs as they pour in from QSL-seekers. These IRCs are frequently sold for less than face value but more than their value at the post office. Typical for IRCs in bulk today would be around $0.40 to .45 each (watch the DX Bulletins for even better values, as big DXpeditions unload thousands of IRCs).

The resale market in IRCs benefits both buyer and seller. The purchaser saves considerable funds on the exchange, as opposed to buying new IRCs at the post office. The seller gets more money than the post office will give him, and this money is in the form of cash without restrictions. This exchange can be so advantageous that an active DX station, receiving lots of IRCs, can finance his entire QSL operation off the "profits." For example, VP2ML hasn't had to chip in a dime for QSL printing or postage in five years.

This particular "extra-postal" use of the IRC is so well accepted in amateur radio that even valueless IRCs are accepted and exchanged among amateurs. I still receive considerable numbers of "old" (and now worthless, at least at the post office) forms of IRCs.

"Planned Obsolescence"

"What?" I hear you say. "IRCs are good 'indefinitely'!" Indeed, UPU regulations state that the IRCs have no expiration date. In the fine print in the regulations, however, one finds the kicker: Only those IRCs whose texts agree with the official text have exchange value. Those with other wording cannot be exchanged at the post office. And the UPU changes the wording on the IRCs every few years! So despite the "indefinite" lifetime of the IRC, they do lose their official value occasionally.

The present IRC is version 15 and has been in circulation (with minor changes) since 1974 (see Fig. 1). The previous version (see Fig. 2) circulated between 1964 and 1974 and has not been accepted by the post office since 1979. Going still further back, we find an earlier version which circulated, with frequent minor changes, between 1929 and 1964 (see Fig. 3). This style was selected in a design competition in 1929 to replace the original IRC from 1906 (see Fig. 4).

I've never received one of the 1906 version, but I have a handful of the 1929-design IRCs, all received long after their "expiration" date. Since the IRC is seldom cashed in the post office, the official expiration of the IRC is not that important to the radio amateur. Since he is not going to cash it in but rather sell it to another amateur, or use it for an amateur-radio purchase, the official value of the IRC loses significance. As long as it is accepted by the amateur community, the IRC retains value.

Universal?

Another anomaly in the amateur-radio

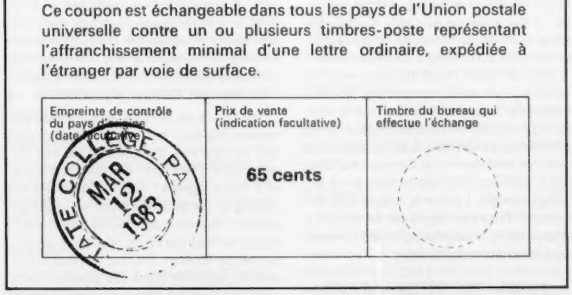
UNION POSTALE UNIVERSELLE
COUPON-REPONSE INTERNATIONAL
C 22
Ce coupon est échangeable dans tous les pays de l'Union postale universelle contre un ou plusieurs timbres-poste représentant l'affranchissement minimal d'une lettre ordinaire, expédiée à l'étranger par voie de surface.
Empreinte de contrôle du pays d'origine (date, éventuellement)
Prix de vente (indication facultative)
65 cents
Timbre du bureau qui effectue l'échange
MAR 12 1983

Fig. 1. The current version of the International Reply Coupon, with the price preprinted in the center. Only IRCs with a stamp of the issuing country on the left are valid at the post office.

UNION POSTALE UNIVERSELLE
BRÉSIL · BRASIL
Cr$ 1,05
Coupon-réponse international
Ce coupon est échangeable dans tous les Pays de l'Union postale universelle contre un ou plusieurs timbres-poste représentant l'affranchissement d'une lettre ordinaire du premier échelon de poids, expédiée à l'étranger par voie de surface.
Cupão-resposta internacional
Este cupão é permutado em todos os Países da União postal universal por um ou mais selos no valor da franquia de uma carta ordinária da primeira escala de pêso, endereçada ao exterior por via de superfície.
COUPON-RÉPONSE INTERNATIONAL
1JUN73

Fig. 2. This type of IRC circulated until 1974 and has been obsolete since 1979. However, many still circulate through the amateur-radio community.

C 23
COUPON-REPONSE INTERNATIONAL
Internationell svarskupong
Denna kupong kan i alla till världspostföreningen hörande länder utbytas mot ett eller flera frimärken till ett belopp, motsvarande befordringsavgiften för ett vanligt brev av enkel viktsats till utlandet.
27.5.61
70 ÖRE
Ce coupon est échangeable dans tous les Pays de l'Union postale universelle contre un timbre-poste ou des timbres-poste représentant le montant de l'affranchissement d'une lettre ordinaire de port simple à destination de l'étranger.
SUÈDE · SVERIGE

Fig. 3. Pre-1964 IRCs looked like this sample. A few of these still travel from amateur to amateur although they have had no official value for 20 years.

COUPON-RÉPONSE INTERNATIONAL
International Reply Coupon
This coupon can be exchanged for postage stamps of the value at 25 centimes or the equivalent of that sum in countries which have adopted the arrangement.
Ce coupon peut être échangé contre un timbre-poste de la valeur de 25 centimes ou de l'équivalent de cette somme, dans les pays qui ont adhéré à l'arrangement.
Etats-Unis d'Amérique. United States of America.

Fig. 4. A copy of the first version of the IRC, from 1906. The form and concept of the IRC have changed little in 80 years.

use of the IRC is in the Soviet-bloc countries. DXers frequently hear that IRCs are "not accepted" in Soviet countries, even though these countries are members of the Union. According to the Universal Postal Union, a country may decline to *sell* IRCs but is required to *exchange* them. However, the UPU has little enforcement power, and the Union has survived as long as it has by staying out of politics. So, many Soviet countries refuse to accept IRCs (at least at most local postal offices). Nevertheless, amateurs in these countries can and do use IRCs as international currency.

The "universality" of the IRC is not the only aspect of these coupons that local postal officials ignore. Many of the smaller post offices in this country do not stock IRCs, and the postmaster may never have heard of them. Even at larger post offices where they know what an IRC is, one can buy invalid IRCs.

Officially, the IRC must be of the current form, with the continuous UPU watermark. (Hold your IRC up to the light to see the watermark.) The current version of the IRC has the official text in seven languages: French, German, English, Arabic, Chinese, Spanish, and Russian. Each IRC must be stamped with the country of sale on the *left* side, as shown in Fig. 1. Unstamped IRCs or those stamped on the right are no good, and the post office can refuse to accept them (see Fig. 5).

Fortunately, enough postmasters are sufficiently ignorant of the rules to take enough bad IRCs in exchange for stamps to make up for the postmasters who issue bad ones. However, to be sure you're getting your money's worth, make certain the IRCs are properly stamped.

All IRCs are basically identical, as they are still printed by the same firm in Switzerland. Individual countries may ask to have a sales denomination printed in the center, as shown in Fig. 1. Otherwise, the center might be blank. The IRC is stamped on the right when it is cashed in to the post office. Used IRCs are destroyed after a complex accounting system balances purchases and sales between the member countries of the UPU.

Meanwhile, international speculation in IRCs continues. One needs only to glance down the list of sales and exchanges of IRCs to see the problem countries. Most countries have about the same number of sales and exchanges of IRCs. For every one sold, one is cashed in. A few countries stand out with enormous sales and few redemptions—especially the US and Japan. This is to be expected, of course, as the more affluent and more internationally-oriented countries buy and send out the most IRCs (especially hams!).

But countries such as Algeria, Ivory Coast, India, Morocco, and Libya sell hundreds of thousands of IRCs; these countries accounted for close to 20% of all IRC sales in 1981–2, but total redemptions were less than 1% of the biennial accounting! Why? Here is where speculators take advantage of the difference in exchange rate.

UNION POSTALE UNIVERSELLE
COUPON-RÉPONSE INTERNATIONAL
C 22
Ce coupon est échangeable dans tous les pays de l'Union postale universelle contre un ou plusieurs timbres-poste représentant l'affranchissement minimal d'une lettre ordinaire, expédiée à l'étranger par voie de surface.
Empreinte de contrôle du pays d'origine (date facultative)
Prix de vente (indication facultative)
65 cents
Timbre du bureau qui effectue l'échange
APR 16 1982

Fig. 5. An invalid IRC: it was stamped on the wrong side by the issuing USPS employee.

They fly their thousands of IRCs elsewhere, say, France, making a reasonable profit on the transaction. Since the profit on each IRC is small, these operators must deal with huge quantities of the coupons.

Most countries have established internal systems to eliminate this speculation. A loophole in the UPU regulations permits any member country to limit the sale of IRCs. Most countries simply won't sell you 100,000 IRCs at a crack! So the speculators need a sympathetic postal administration in the country of purchase.

Fortunately, this limits the abuse of the IRC system. Dr. Tuason's concerns notwithstanding, the IRC looks as if it will be around for another 75+ years, providing DXers with a much-needed international exchange medium.

(Special thanks to L. Rubens of the International Bureau of the Universal Postal Union for his invaluable assistance in preparing this column.)

DR. DIGITAL

Robert Swirsky AF2M
PO Box 122
Cedarhurst NY 11516

PUBLIC DISSERVICE

Not too long ago I was in Carnegie Hall to see Peter Schickele and his orchestra, "The New York Pick-Up Ensemble." I had purchased the tickets at the last minute and had to choose among seats in the balcony, where the view leaves something to be desired.

Just as the performance was about to start, I was shocked to hear the loud high-pitched beeps of a 2-meter repeater's IDer. I looked around to see where this wretched noise was coming from and was able to locate its source! It came from a hand-held radio clipped to the belt of the gentleman seated behind me.

"Please turn your CB radio off," I said to him, in as nice a tone as I could muster. I carefully worded this statement, calling his 2-meter radio a CB, to infuriate him, which it did.

I was not, however, expecting the lecture that followed. He told me that he was performing a public service by providing a medium for emergency communication, carefully wording his statement so as to make one think that he was an undercover peace officer. I informed him that I had stopped "playing policeman" well before I entered kindergarten, and perhaps it was time for him to do the same, especially at his advanced age.

After his radio blared off about three more times, the usher came along and ordered him to turn the radio off or leave. He chose the option of leaving, and the remainder of the audience was able to enjoy the show without the nuisance of some misguided ham performing a "public service."

What reminded me of this story was that recently I was asked to operate a "specialized-mode" station for a local radio club during Field Day. I had to decline the invitation because I had tickets to see the comedian Pee Wee Herman at Carnegie Hall that same weekend. One has to keep one's priorities straight. I am only hoping that, because of Field Day, there will be less of a chance of my encountering another ill-mannered amateur-radio operator.

COMPUTER INTERFACING

Last month we examined one implementation of "memory-mapped" I/O control. Now we will examine another method, employed in the Atari and VIC computers as well as many others.

There are a number of integrated circuits known as input/output chips, or support chips, that are designed to work in conjunction with the 6502 microprocessor. (The 6502 is the microprocessor that both the Atari and VIC computers use.) These chips simplify I/O interfacing and eliminate the confusing conventions that other manufacturers, such as Apple, chose to employ.

The device we will look at is the 6520 peripheral interface adapter, or PIA. This circuit incorporates the circuitry for two I/O ports, each 8 bits wide. For each port there is a "data register" that contains the incoming or outgoing data and a "direction register" that controls whether corresponding signal lines are inputs or outputs. A zero is used to represent an input line and one is used to represent (have you guessed yet?) an output line. The programmer can control which lines are to be used for input or output simply by placing the proper combina-

tions of zeroes and ones in the direction register. Data are then read by examining the data register and are sent to another device by writing to the data register. It is really a fairly simple procedure. The 6520 PIA chip also contains a control register that contains various status signals needed for handshaking, and other bits to control the internal logic configuration.

On the Atari 400 and 800 computers, the data lines from the PIA chip are presented to the outside world via the four "Player Ports" on the front panel. See Fig. 1 for a pinout diagram of each of these ports. Commodore's VIC computers have a similar arrangement. Consult the *VIC Reference Manual* for complete details.

As the 6502 microprocessor has no specific input and output commands in its instruction set, all I/O is "memory mapped," that is, certain memory addresses are set aside for I/O use. If a PIA chip is used in conjunction with a 6502 to control I/O, it too must occupy memory addresses. The 6520 PIA requires four memory addresses; the exact locations of these depend on how the computer system was designed. In the Atari computers, the 6520 PIA is located at memory locations 54016 to 54019 inclusive (hex locations D300 to D303).

Internally, the PIA has six registers: two data registers, two direction registers, and two control registers. Because the PIA uses only four memory locations, it is necessary to have one extra bit to address the proper register. Bit 2 of the control registers serves this purpose. If this bit contains a 0, then the corresponding register is a data register. If the bit is a 1, then the corresponding register is a peripheral register.

Programming the PIA chip is often complicated because the computer uses this chip for its own internal purposes; reconfiguring it may cause the computer to do strange things (all will clear up when the computer is reset, or powered off and on). For example, Atari uses the PIA to control the joystick and stick triggers, the cassette recorder motor (on or off), and whether or not the voice channel of the cassette recorder is sent to the television set. The ability to control a cassette recorder makes it possible to have computer-controlled instructional material supplemented with recorded voice or music. Commands to control a cassette recorder are as follows:

POKE 54018,60 Turn cassette motor off
POKE 54018,52 Turn cassette motor on

The music, voice, Morse code, noise, or any material you have recorded on tape will play through the television set speaker. This technique might be used for a Morse-code or radio-theory computer-assisted learning program.

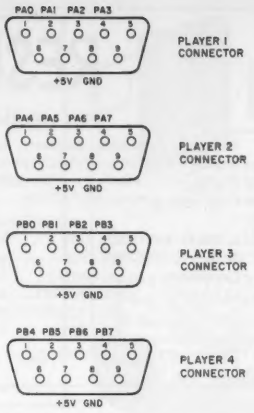

Fig. 1. The four Atari player connectors and the pins that correspond to PIA 6520 connections. The PAn series stands for port A, and the PBn series is for port B. Unmarked connections are used for paddle and stick trigger connections, and are not connected to the PIA chip.

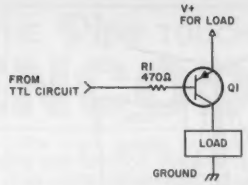

Fig. 2. Connecting a device to a TTL circuit using a PNP transistor.

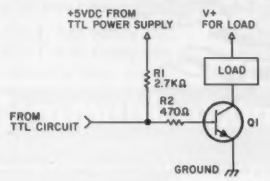

Fig. 3. Connecting a device to a TTL circuit using an NPN transistor.

Location 54018 is the Port A control location for the Atari's PIA. The POKE commands specified above change bit 3 of this register, which corresponds to control line #2, which is used to switch the recorder's power on or off.

This brief introduction to the 6520 PIA was meant to explain how memory-mapped I/O is aided with peripheral control chips. For a complete guide to configuring the 6520, I recommend the book, *6502 Assembly Language Programming*, by Lance Leventhal (Osborne/McGraw Hill, 1979). Mr. Leventhal explains clearly the internal structure of the chip and provides numerous programming examples of real-life interface problems.

CONNECTING TTL TO THE OUTSIDE WORLD

The output of a TTL chip (such as the 6520 PIA) cannot be connected directly to another device; it simply doesn't have the current-carrying abilities. However, small loads can be controlled with the aid of a PNP or NPN transistor. Choose a transistor with enough current-carrying capability to drive your load. For controlling very large loads, it is recommended that you use either a transistor or an optoisolator. When using a relay, remember to connect a diode in parallel with the relay coil to prevent voltage spikes from ruining the transistor.

Figs. 2 and 3 contain the circuit diagrams for using a PNP and an NPN transistor, respectively. Notice that when using an NPN transistor, a "pull-up" connection is needed. This is because the TTL output must be provided with a current source in order to function correctly.

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

THE WILDBUNCH 160 SSB CONTEST
Starts: 0000 GMT August 4
Ends: 2359 GMT August 5

This contest is for single operators only.

EXCHANGE:

RST and state, province, or country. Charter members must also give their membership number with the exchange.

SCORING:

Count 10 points per QSO and multiply by the total number of states, countries, and VE provinces. Work any charter member of the Wildbunch for a special multiplier of 1 point each. Work 15 charter members and get a special bonus of 20 points. Work the VE7WCB club station and add 10 points.

AWARDS:

Plaque to the winner and certificates to winners in each state, country, and VE province. Special certificate for working all 30 charter members.

ENTRIES:

Deadline for logs is September 6th, with entries addressed to: R. J. Koziomkowski KA1SR, 5 Watson Drive, Portsmouth RI 02871. To become a member of the 160-meter Wildbunch between June 1st and September 1st, US stations work 10 charter members, DX work 5. From September 1st to June 1st, double the number of QSOs required to 20 and 10. Send log info and US$2.00 for membership certificate and Wildbunch number to Bob LeBlanc KA1FDS, Unity Road, Benton, RFD 1, Box 800, Clinton ME 04927.

ILLINOIS QSO PARTY
Starts: 1700 GMT August 5
Ends: 0500 GMT August 6

Sponsored by RAMS, the Radio Amateur Megacycle Society. Use all bands, CW and phone. The same station may be worked on each band and mode. No repeater contacts are allowed.

EXCHANGE:

RS(T) and state, province, country, or Illinois county.

FREQUENCIES:

Any frequency, but look for most activity; about 40 kHz from low end on CW, and about 3890, 7230, 14280, 21375, and 28675 on phone.

SCORING:

One QSO point per contact or two points if the other station is a Novice or Technician in a Novice band. Illinois stations multiply QSO point total by the total number of states (50 max), VE/VO call areas (10 max), and no more than 5 non-W/K/VE/VO DX countries worked for a maximum of 65 multipliers. Additional DX contacts count for QSO points but not for additional multipliers. Illinois portables or mobiles away from normal QTH may add 200 to final score for each county of operation from which 10 or more contacts were made.

Non-Illinois stations multiply QSO points by the number of Illinois counties worked. Only Illinois stations may be counted for QSO points. Non-Illinois stations may also take extra bonus multipliers for each group of 8 QSOs with the same county.

AWARDS:

Certificates to the top 3 Illinois scorers in Single op, Multi-op, portable out-of-home-county, mobile, Novice, and CW Technician categories. For out-of-staters, awards go to top scorers in similar categories in each state, province, or country

CALENDAR

AUG 4-5	ARRL UHF Contest
AUG 4-5	Wildbunch 160 SSB Contest
AUG 5-6	Illinois QSO Party
AUG 11-13	New Jersey QSO Party
AUG 18-19	SARTG Worldwide RTTY Contest
AUG 24-27	A5 North American UHF FSTV-DX Contest
AUG 25-26	Occupation Contest
SEP 1	DARC Corona 10-Meter RTTY Contest #3
SEP 8-9	ARRL VHF QSO Party
SEP 15-16	Ohio QSO Party
SEP 15-17	Washington State QSO Party
SEP 21-23	Maine QSO Party
SEP 22-23	Late-Summer QRP CW Activity Weekend
OCT 6-7	ARRL QSO Party—CW
OCT 13-14	ARRL QSO Party—Phone
OCT 13-14	Rio CW DX Party
OCT 13-14	Columbus Day International DX Contest
OCT 13-15	Oregon QSO Party
OCT 20-21	Jamboree on the Air
OCT 20-21	Worked-All Y2 Contest
NOV 3	DARC Corona 10-Meter RTTY Contest #4
NOV 3-4	ARRL Sweepstakes—CW
NOV 17-18	ARRL Sweepstakes—Phone
DEC 1-2	ARRL 160-Meter Contest
DEC 8-9	ARRL 10-Meter Contest
DEC 26-JAN 1	QRP Winter Sports—CW
DEC 30	Canada Contest

NEWSLETTER OF THE MONTH

This month the laurels go to Editor Al Berg WB7SIC and *OTVARC*, journal of the Oregon Tualatin Valley ARC. Al tries very hard to include items of interest for everyone—a tough job in a club with 230+ members! The result is a collection of news and views presented in a friendly, easygoing style with eye-catching graphics that grab a reader's attention.

OTVARC is obviously a dynamic group of people who thrive on a steady diet of ham radio, social events, and public service. Congratulations to President Dave Parker W7LJN, Vice-President John Haide WA7CZA, and their fellow OTVARCs for doing it better than anyone else.

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

RESULTS

1984 VIRGINIA QSO PARTY

Winners of major award plaques:
Virginia fixed station—WA4NTP (78,921), Virginia mobile station—WA4PGM/M (63,800), Virginia CW only—K0RI (42,028), Virginia QRP station—KW4I (13,608), Out-of-state station—NC2V (7,590).

State winners (24 states)

AL—WA4VEK	ID—KA7T	MI—W8WVU	OK—KJ9R
AZ—W7YS	IL—KY9F	MT—KA7PMU	PA—W3ZX
CA—W6NNY	LA—W5WG	NC—K4JEX	TX—W5PWG
CT—K1BV	MA—WA1REI	NJ—NC2V	WA—W7DRA
FL—WK4F	MD—K3LK	NM—AI9X	WV—W3IJT
IA—K0HQE	ME—KA1ZV	NV—KA7GXO	WY—NC7O

DX winners: Canada—VE3KK; Spain—EA2IA.

from which 2 valid entries are received. Please send in even low-scoring logs to help another meet the two-log rule. Decisions of the contest committee are final.

ENTRIES:

Logs must be legible and be submitted along with a summary sheet listing all claimed multipliers and calculations of score. Operator(s) name, address, call, and operation category must be typed or printed clearly. Include a business-size SASE for return of results.

Entries must be postmarked no later than September 1st and sent to RAMS/K9CJU, 3620 N. Oleander Avenue, Chicago IL 60634.

NEW JERSEY QSO PARTY
2000 GMT August 11 to 0700 GMT August 12
1300 GMT August 12 to 0200 GMT August 13

The Englewood ARA invites all amateurs worldwide to participate in the 25th annual New Jersey QSO Party. Phone and CW are considered the same contest. A station may be contacted once on each band; phone and CW are considered separate "bands" but CW contacts may not be made in phone-band segments. NJ stations may work other NJ stations.

EXCHANGE:

QSO number, RS(T), and ARRL section, country, or NJ county.

FREQUENCIES:

1810, 3535, 3900, 7035, 7135, 7235, 14035, 14280, 21100, 21355, 28100, 28610, 50–50.5, and 144–146. Suggest phone activity on the even hours; 15 meters on the odd hours (1500 to 2100 GMT); 160 meters at 0500 GMT.

SCORING:

Out-of-state stations multiply the number of complete contacts with NJ stations times the number of NJ counties worked (21 maximum). NJ stations count 1 point per W/K/VE/VO QSO and 3 points per DX QSO. Multiply total QSO points by the number of ARRL sections (including NNJ and SNJ—maximum 74). KP4, KH6, KL7, etc., count as 3-point DX contacts and as section multipliers.

AWARDS:

Certificates will be awarded to the first-place station in each NJ county, ARRL section, and country. In addition, a second-place certificate will be awarded when 4 or more logs are received. Novice, Technician, and mobile-operator certificates will also be awarded.

ENTRIES:

Logs must show date/time in GMT, band, and emission. Logs must be received not later than September 8th. The first contact for each claimed multiplier must be indicated and numbered and a checklist of contacts and multipliers should be included. Multi-operator stations should be noted and calls of participating operators listed. Logs and comments should be sent to Englewood Amateur Radio Association, Inc., PO Box 528, Englewood NJ 07631.

A #10 (business) size SASE should be included for results. Stations planning active participation in NJ are requested to advise the EARA by August 1st of their intentions so that they can plan for full coverage from all counties. Portable and mobile operation is encouraged.

SARTG WORLDWIDE RTTY CONTEST
Contest Periods:
0000 to 0800 GMT August 18
1600 to 2400 GMT August 18
0800 to 1600 GMT August 19

This is the 14th annual contest sponsored by the Scandinavian Amateur Radio Teletype Group (SARTG). Operating classes include (a) single operator, (b) multi-operator/single transmitter, and (c) SWL. Please note the logs from multi-operator stations must contain the names and callsigns of all operators involved. The same station may be worked once on each band for QSO and multiplier credits. Only 2-way RTTY QSOs will count.

EXCHANGE:

RST and QSO number.

SCORING:

QSOs with your own country count 5 points. Other countries in the same continent are 10 points. Other continents are 15 points. In USA, Canada, and Australia, each call district will be considered as a separate country. Use the DXCC list and the above-mentioned call areas for multipliers. Note that contacts with a station which would count as a multiplier must be found in at least 5 logs or a contest log must be received from the multiplier station in order to be valid. Final score is the sum of QSO points times the sum of the multipliers. SWLs use the same rules for scoring, but based on stations and messages copied.

AWARDS:

Top stations in each class, country, W/K, VE/VO, and VK call district if the number of QSOs is reasonable.

ENTRIES:

Logs must be received by October 10th and should contain: band, date/time in GMT, callsign, exchanges sent and received, points, multipliers, and final score. Use a separate sheet for each band and enclose a summary sheet showing the scoring, classification, callsign, name, and address. In the case of multi-operator stations, include the names and callsigns of all operators involved. Comments will be very much appreciated by the contest committee. Send logs to: SARTG Contest & Award Manager, C. J. Jensen OZ2CJ, PO Box 717, 8600 Silkeborg, Denmark.

OCCUPATION CONTEST
Starts: 1800 GMT August 25
Ends: 2400 GMT August 26

The Radio Association of Erie, Pennsylvania, is sponsoring its annual contest, open to all amateur radio operators.

EXCHANGE:

RS(T); occupation; and state, province, or country.

FREQUENCIES:

CW—40 kHz from the bottom of the ham bands; phone—3920, 7250, 14300, 21400, and 28600.

SCORING:

Score 3 points for each new occupation worked, one point for all similar occupations worked, and 2 points for all retirees worked. There are no multipliers.

ENTRIES:

Mailing deadline for logs is October 1st, and they are to be sent to Harry Arsenault K1PLR/3, 603 Powell Avenue, Erie PA 16505. Enclose an SASE for a copy of the results.

CORRECTIONS

Re: "Painless Op-Amp Filter Design," April, 1984: The article contains a major technical error. All claims with reference to the gain characteristics of the bi-quad filter should be ignored. The erroneous interpretation of data acquired from breadboard models of the bi-quad resulted from too literally interpreting sources that list the gain of the bi-quad filter as its Q. This is true only for the design center frequency for normalized models. Examination of the transfer function for the bi-quad shows a relatively flat gain even for wide-frequency-range filters, such as those shown in the original article. Greater ranges of gain may be expected for variable-Q models. The measured results for breadboard models are in close agreement with or greater than predictions from the transfer function. The remaining design techniques, especially for determining the tuning range, still apply. For variable-output-level filters, an output-leveling technique is useful in many applications. I sincerely regret the error and offer my thanks to Frank W. Heemstra for pointing it out.

L. B. Cebik W4RNL
Knoxville TN

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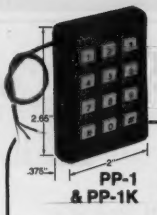

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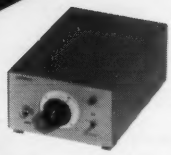

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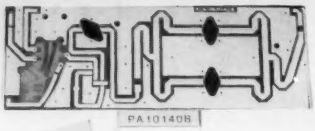

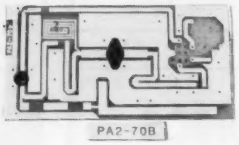

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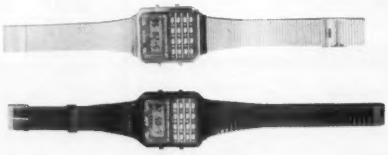
Model PA2-70B RF power input 2watts at 144 to 148MHz output 70watts 13.5vdc at 10amps.
$49.99 with data PC Board Only $14.99

MODEL PA10140B RF power input 10watts at 144 to 148MHz output 140watts 13.5vdc at 18amps.
$89.99 with data PC Board Only $19.99

GENEVA CALCULATOR WATCH

This attractive watch has the following modes:
Normal Time Setting,
Calendar Setting,
Daily Alarm Time Setting,
Weekly Alarm Time Setting,
Chronograph,
Calculator.



Featured in Black Plastic **$18.99** or Featured in Stainless Steel $29.99

SILICON DIODES

MR751	100vdc	6Amps	10/$5.00	100/$38.00
MR510	1000vdc	3Amps	10/$3.75	100/$24.00
HEP170	1000vdc	2Amps	20/$2.00	100/$15.00
1N3209	100vdc	15Amps	$2.00	10/ $15.00
BYX21/200	200vdc	25Amps	$2.00	10/ $15.00
1N2138A	600vdc	60Amps	$5.00	10/ $40.00
DS85-04C	400vdc	80Amps	$10.00	10/ $80.00
1N3269	600vdc	160Amps	$15.00	10/$120.00
275Z41	300vdc	250Amps	$20.00	10/$175.00
7-5754	300vdc	400Amps	$30.00	10/$250.00
RCD-15	15KVDC	20ma.	$3.00	10/ $20.00
SMFR20K	20KVDC	20ma.	$4.00	10/ $30.00
1N4148	signal		30/$1.00	100/ $3.00

FEED THRU SOLDER RF CAPACTORS

470pf +-20%

5/$1.00 or 100/$15.00 or 1000/$100.00

1000pf/.001uf +-10%

4/$1.00 or 100/$20.00 or 1000/$150.00

E PROMS

2708 1024x1	$2.00 each
2716 2048x8	$4.00 each
27L32/25L32	$10.00 each

FAIRCHILD 4116 16K DYNAMIC RAMS 200ns. Part # 16K75

25 For $25.00 or 100 For $90.00 or 1000 For $750.00

HEWLETT PACKARD MICROWAVE DIODES

1N5711	(5082-2800)	Schottky	Barrier	Diodes		$1.00 or 10 for $ 8.50
1N5712	(5082-2810)	"	"	"		$1.50 or 10 for $10.00
1N6263	(HSCH-1001)	"	"	"		$ .75 or 10 for $ 5.00
5082-2835		"	"	"		$1.50 or 10 for $10.00
5082-2805	Quad Matched	"	"	"	per set	$5.00 or 10 for $40.00

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"MIXERS"

WATKINS JOHNSON WJ-M6 Double Balanced Mixer

LO and RF 0.2 to 300MHz	IF DC to 300MHz	$21.00
Conversion Loss (SSB)	6.5dB Max. 1 to 50MHz 8.5dB Max. .2 to 300MHz	WITH DATA SHEET
Noise Figure (SSB)	same as above 8.5dB Max. 50 to 300MHz	
Conversion Compression	.3dB Typ.	

NEC (NIPPON ELECTRIC CO. LTD. NE57835/2SC2150 Microwave Transistor

NF Min F=2GHz	dB 2.4 Typ.	MAG F=2GHz	dB 12 Typ.	$5.30
F=3GHz	dB 3.4 Typ.	F=3GHz	dB 9 Typ.	
F=4GHz	dB 4.3 Typ.	F=4GHz	dB 6.5 Typ.	

Ft Gain Bandwidth Product at Vce=8v, Ic=10ma. GHz 4 Min. 6 Typ.
Vcbo 25v Vceo 11v Vebo 3v Ic 50ma. Pt. 250mw

UNELCO RF Power and Linear Amplifier Capacitors

These are the famous capacitors used by all the RF Power and Linear Amplifier manufacturers, and described in the RF Data Book.

5pf	10pf	18pf	30pf	43pf	100pf	200pf	1 to 10pcs. $1.00 ea
5.1pf	12pf	22pf	32pf	51pf	110pf	220pf	11 to 50pcs. $ .90 ea
6.8pf	13pf	25pf	33pf	60pf	120pf	470pf	51 up pcs. $ .80 ea
7pf	14pf	27pf	34pf	80pf	130pf	500pf	
8.2pf	15pf	27.5pf	40pf	82pf	140pf	1000pf	

NIPPON ELECTRIC COMPANY TUNNEL DIODES $7.50

		MODEL 1S2199	1S2200
Peak Pt. Current ma.	Ip	9min. 10Typ. 11max.	9min. 10Typ. 11max.
Valley Pt. Current ma.	Iv	1.2Typ. 1.5max.	1.2Typ. 1.5max.
Peak Pt. Voltage mv.	Vp	95Typ. 120max.	75Typ. 90max.
Projected Peak Pt. Voltage mv.	Vpp Vf=Ip	480min. 550Typ. 630max.	440min. 520Typ. 600max.
Series Res. Ohms	rS	2.5Typ. 4max.	2Typ. 3max.
Terminal Cap. pf.	Ct	1.7Typ. 2max.	5Typ. 8max.
Valley Pt. Voltage mv.	VV	370Typ.	350Typ.

FAIRCHILD / DUMONT Oscilloscope Probes Model 4290B

Input Impedance 10 meg., Input Capacity 6.5 to 12pf., Division Ratio (Volts/Div Factor) 10:1, Cable Length 4Ft. , Frequency Range Over 100MHz.
These Probes will work on all Tektronix, Hewlett Packard, and other Oscilloscopes.

PRICE $45.00

MOTOROLA RF DATA BOOK

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RF TRANSISTORS, MICROWAVE DIODES

TYPE	PRICE
2N1561	$ 25.00
2N1562	25.00
2N1692	25.00
2N2957	1.55
2N2857JANTX	4.10
2N2857JANTXV	4.10
2N2876	13.50
2N2947	18.35
2N2948	13.00
2N2949	15.50
2N3375	17.10
2N3553	1.55
2N3632	15.50
2N3733	11.00
2N3818	5.00
2N3866	1.30
2N3866JAN	2.20
2N3924	3.35
2N3927	17.25
2N3950	25.00
2N4012	11.00
2N4041	14.00
2N4072	1.80
2N4080	4.53
2N4127	21.00
2N4427	1.30
2N4428	1.85
2N4430	11.80
2N4957	3.45
2N4959	2.30
2N5090	13.80
2N5108	3.45
2N5109	1.70
2N5160	3.45
2N5177	21.62
2N5179	1.04
2N5216	56.00
2N5583	3.45
2N5589	9.77
2N5590	10.92
2N5591	13.80
2N5637	15.50
2N5641	12.42
2N5642	14.03
2N5643	15.50
2N5645	13.80
2N5646	20.70
2N5651	11.05
2N5691	18.00
2N5764	27.00
2N5836	3.45
2N5842/MM1607	8.45
2N5849	20.00
2N5913	3.25
2N5916	36.00
2N5922	10.00
2N5923	25.00
2N5941	23.00
2N5942	40.00
2N5944	10.35
2N5945	11.50
2N5946	14.40
2N6080	10.35
2N6081	12.07
2N6082	12.65
2N6083	13.25
2N6084	15.00
2N6094	11.00
2N6095	12.00
2N6096	16.10
2N6097	20.70
2N6105	21.00
2N6136	21.85
2N6166	40.24
2N6201	50.00
2N6304	1.50
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2N6567	10.06
2N6680	80.00
2SC703	3.00
2SC756A	7.50
2SC781	2.80
2SC1018	1.00
2SC1042	12.00
2SC1070	2.50
2SC1239	2.50
2SC1251	12.00
2SC1306	2.90
2SC1307	5.50
2SC1424	2.80
2SC1678	$ 2.00
2SC1729	20.00
2SC1760	1.50
2SC1909	4.00
2SC1946	36.00
2SC1946A	40.00
2SC1970	2.50
2SC1974	4.00
2SC2166	5.50
2SC2237	32.00
2SC2695	47.00
A50-12	25.00
A209	10.00
A283	5.00
A283B	6.00
AF102	2.50
AFY12	2.50
BF272A	2.50
BFR21	2.50
BFR90	1.00
BFR91	1.65
BFR99	2.50
BFT12	2.50
BFW16A	2.50
BFW17	2.50
BFW92	1.50
BFX44	2.50
BFX48	2.50
BFX65	2.50
BFX84	2.50
BFX85	2.50
BFX86	2.50
BFX89	1.00
BFY11	2.50
BFY18	2.50
BFY19	2.50
BFY39	2.50
BFY90	1.00
BLX67	15.24
BLX68C3	15.24
BLX93C3	22.21
BLY87A	8.94
BLY88C3	13.08
BLY94C	21.30
BLY351	10.00
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Dexcel GaAs FET	
DXL3501A-P100F	49.30
Fujitsu GaAs FET	
FSX52WF	58.00
GMC290A	2.50
HEP76	4.95
HEPS3002	11.40
HEPS3003	30.00
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HEPS3006	19.90
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Hewlett Packard	
HFET2204	112.00
35821E	38.00
35826B	32.00
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35831E-H31	30.00
35831E	30.00
35832E	50.00
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35853E	71.50
35854E	75.00
35866E	44.00
HXTR3101	7.00
HXTR3102	8.75
HXTR5104	30.00
HXTR6104	68.00
HXTR6105	31.00
HXTR6106	33.00
J310	.70
TRW	
JCQ000	10.00
JCQ001	25.00
JO4045	25.00
Motorola Comm.	
M1131	8.50
M1132	11.95
M1134	$ 16.90
M9579	7.95
M9588	7.50
M9622	7.95
M9623	9.95
M9624	11.95
M9625	17.95
M9630	18.00
M9740	29.90
M9741	29.90
M9755	19.50
M9848	37.00
M9850	16.90
M9851	20.00
M9887	5.25
MEL80091	25.00
MM1550	10.00
MM1552	50.00
MM1553	50.00
MM1614	10.00
MM1943/2N4072	1.80
MM2608	5.00
MM3375A	17.10
MM4429	10.00
MM8000	1.15
MM8006	2.30
MM8011	25.00
MPF102	.45
MPSU31	1.01
MRA2023-1.5	42.50
MRF208	16.10
MRF212	16.10
MRF223	13.25
MRF224	15.50
MRF231	10.92
MRF232	12.07
MRF233	12.65
MRF237	3.15
MRF238	13.80
MRF239	17.25
MRF245	35.65
MRF247	35.65
MRF304	43.45
MRF309	33.81
MRF314	28.52
MRF315	28.86
MRF316	POR
MRF317	63.94
MRF420	20.00
MRF421	36.80
MRF422A	41.40
MRF427	17.25
MRF428	46.00
MRF433	12.07
MRF449/A	12.65
MRF450/A	14.37
MRF453/A	18.40
MRF454/A	20.12
MRF455/A	16.00
MRF458	20.70
MRF463	25.00
MRF472	1.00
MRF475	3.10
MRF476	2.00
MRF477	14.95
MRF492	23.00
MRF502	1.04
MRF503	6.00
MRF504	7.00
MRF509	5.00
MRF511	10.69
MRF515	2.00
MRF517	2.00
MRF559	2.05
MRF605	20.00
MRF618	25.00
MRF628	8.65
MRF629	3.45
MRF644	27.60
MRF646	29.90
MRF816	15.00
MRF823	20.00
MRF901 (3) Lead	1.00
MRF901 (4) Lead	2.00
MRF904	2.30
MRF911	3.00
MRF961	2.30
MRF8004	2.10
MS261F	POR
MSC1720-12	225.00
MSC1821-3	$125.00
MSC1821-10	225.00
MSC2001	40.00
MSC2223-10	200.00
MSC3000	50.00
MSC3001	50.00
MSC73001	50.00
MSC82001	40.00
MSC82014	40.00
MSC82020	40.00
MSC82030	40.00
MSC83001	50.00
MSC83005	100.00
MT4150	14.40
MT5126	POR
MT5596/2N5596	99.00
MT5768/2N5768	95.00
MT8762	POR
NEC2136	2.50
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NE21889	POR
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PT3190	POR
PT3194	POR
PT3195	POR
PT3537	7.80
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PT4176D	POR
PT4186B	POR
PT4209	POR
PT4209C/5645	POR
PT4556	24.60
PT4570	7.50
PT4577	POR
PT4590	POR
PT4612	POR
PT4628	POR
PT4640	POR
PT4642	POR
PT5632	4.70
PT5749	POR
PT6629	POR
PT6709	POR
PT6720	POR
PT8510	POR
PT8524	POR
PT8609	POR
PT8633	POR
PT8639	POR
PT8659	POR
PT8679	POR
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40081	5.00
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40280	4.62
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* R F TRANSISTORS *

TYPE	PRICE	TYPE	PRICE	TYPE	PRICE	TYPE	PRICE
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SD345	$ 5.00	SD1119	$ 5.00	SD1278-5	$18.00	SD1454-1	48.00
SD445	5.00	SD1124	50.00	SD1281-2	8.00	SD1477	48.00
SD1004	15.00	SD1127	3.50	SD1283	10.00	SD1478	21.00
SD1009	15.00	SD1133	14.00	SD1289-1	15.00	SD1480	60.00
SL1009-2	15.00	SD1133-1	14.00	SD1290-4	15.00	SD1484	1.50
SD1012	9.90	SD1134-1	3.00	SD1290-7	15.00	SD1484-5	1.50
SD1012-3	9.90	SD1135	8.00	SD1300	3.00	SD1484-6	1.50
SD1012-5	9.90	SD1136	15.00	SD1301-7	3.00	SD1484-7	1.50
SD1013-3	13.50	SD1136-2	15.00	SD1305	3.00	SD1488	39.00
SD1013-7	13.50	SD1143-1	12.00	SD1307	3.00	SD1488-1	28.00
SD1014	11.00	SD1143-3	17.00	SD1308	3.00	SD1488-7	27.00
SD1014-6	11.00	SD1144-1	3.00	SD1311	1.00	SD1488-8	28.00
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SD1018-4	15.00	SD1188	10.00	SD1345-6	5.00	SD1522-4	33.00
SD1018-6	15.00	SD1189	24.00	SD1365-1	2.50	SD1528-1	24.00
SD1018-7	15.00	SD1200	1.50	SD1365-5	2.50	SD1528-3	34.00
SD1018-15	15.00	SD1201-2	10.00	SD1375	7.50	SD1530-2	38.00
SD1020-5	10.00	SD1202	10.00	SD1375-6	7.50	SD1536-1	41.00
SD1028	15.00	SD1212-11	4.00	SD1379	15.00	SD1545	34.00
SD1030-2	12.00	SD1212-12	4.00	SD1380-1	1.00	SD1561	79.00
SD1043	12.00	SD1212-16	4.00	SD1380-3	1.00	SF4557 Mot.	25.00
SD1043-1	10.00	SD1214-7	5.00	SD1380-7	1.00	SK3048 RCA	5.00
SD1045	3.75	SD1214-11	5.00	SD1405	40.00	SK3177 RCA	15.00
SD1049-1	2.00	SD1216	12.00	SD1409	18.00	SMS7714 Mot.	2.50
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SD1065	4.75	SD1219-5	15.00	SD1410-3	21.00	SRF1018 Mot.	5.00
SD1068	15.00	SD1219-8	15.00	SD1413-1	18.00	SRF2147 Mot.	22.00
SD1074-2	18.00	SD1220	8.00	SD1416	50.00	SRF2356 Mot.	38.00
SD1074-4	28.00	SD1220-9	8.00	SD1422-2	24.00	SRF2378 Mot.	16.00
SD1074-5	28.00	SD1222-8	16.00	SD1428	33.00	SRF2584 Mot.	40.00
SD1076	20.00	SD1222-11	7.50	SD1429-2	15.00	SRF2821 Mot.	25.00
SD1077-4	4.00	SD1224-10	18.00	SD1429-3	15.00	SRF2857 Mot.	20.00
SD1077-6	4.00	SD1225	18.00	SD1429-5	15.00	TA8894 RCA	15.00
SD1078-6	24.00	SD1228-8	POR	SD1430	12.00	TIS189/MRF966	3.55
SD1080-8	6.00	SD1229-7	13.00	SD1430-2	18.00	TP312	2.50
SD1080-9	3.00	SD1229-16	13.00	SD1434-5	30.00	TP1014 TRW	5.00
SD1084	8.00	SD1232	4.00	SD1434-9	30.00	TP1028 TRW	15.00
SD1087	15.00	SD1240-8	15.00	SD1438	26.00	01-80703T04/	
SD1089-5	15.00	SD1244-1	14.00	SD1441	91.00	458-949 Mot.Comm.	65.00
SD1095	15.00	SD1262	12.00	SD1442	15.00	TXVP2201 H.P.	450.00
SD1100	5.00	SD1263	15.00	SD1444	6.00	62803 RCA	100.00
SD1109	18.00	SD1263-1	15.00	SD1444-8	6.00	TA7205/2N5921	80.00
SD1115-2	8.00	SD1272	13.00	SD1450-1	28.00	TA7487/2N5920	75.00
SD1115-3	8.00	SD1272-2	15.00	SD1451	18.00	TA7995/2N6267	150.00
SD1115-7	2.50	SD1272-4	15.00	SD1451-2	18.00	SRF2092 Mot.	18.00
SD1116	5.00	SD1278	20.00	SD1452	20.00	MRF479	8.05
SD1118	22.00	SD1278-1	18.00	SD1452-2	20.00		

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1N21	$ 3.40	1N21B	$ 3.40	1N21BR	$ 3.40	1N21C	$ 3.40
1N21D	4.00	1N21DR	4.00	1N21ER	6.00	1N21RF	5.00
1N21WE	5.80	1N21WG	5.80	1N22	5.00	1N23A	10.00
1N23B	3.40	1N23C	3.40	1N23CR	3.40	1N23D	4.95
1N23DR	4.00	1N23WE	5.00	1N25	7.50	1N25AR	18.00
1N28WE	10.00	1N29	10.00	1N32	20.00	1N53A	55.50
1N76	26.00	1N76R	28.00	1N78	26.00	1N78A	20.00
1N78B	26.00	1N78D	28.00	1N78DR	28.00	1N78R	28.00
1N149	6.00	1N150MR	18.00	1N415	4.00	1N415C	4.00
1N415G	15.00	1N416D	5.00	1N416E	6.00	1N446	10.00
1N831	10.00	1N833	10.00	1N950	4.00	1N1084	2.00
1N2930	15.00	1N2932	15.00	1N3540	15.00	1N3712	11.00
1N3713	18.00	1N3714	11.00	1N3715	16.00	1N3716	10.00
1N3717	14.00	1N3718	10.00	1N3721	14.00	1N3733	10.00
1N3747	21.00	1N4386	20.00	1N4396	15.00	1N4785	11.00
1N4812B	9.00	1N5139A/B	4.25	1N5140A/B	4.25	1N5141A/B	4.25
1N5142A/B	4.25	1N5143A/B	4.25	1N5144A/B	4.25	1N5145A/B	4.25
1N5146A/B	4.25	1N5147A/B	4.25	1N5148A/B	4.25	1N5167	5.50
1N5453	3.75	1N5465	7.65	1N5711	1.00	1N5711 JAN	2.00
1N5713	5.00	1N5767	2.00	1N6263	1.00	1S2199	15.00
1S2200	15.00	1S2208/9	1.00	8B1087/48R869558	65.00	8D3020	65.00
A2X116M Aertech	50.00	BB105B	1.00	BB105G	1.00	BD4/4JFBD4 G.E.	15.00
BL161 Bomac	5.00	CMD514AB C.M.	POR	D4060 Alpha	POR	D4159 Alpha	POR
D4233B Alpha	POR	D4900 Alpha	POR	D4959 Alpha	POR	D4987M Alpha	POR
D5047C Alpha	POR	D5147D Alpa	POR	D5503 Alpha	POR	D5506 Alpha	POR
DGB6158-98 Alpha	POR	DMD6022 Alpha	POR	DMD6460A Alpha	POR	DP20054 Crown	POR
GC1691-89 GHZ	31.35	GC1602-89 GHZ	31.35	GC1607-40 GHZ	31.35	GC2531-88 GHZ	37.40
GC2542-46 GHZ	37.40	GC3208-40 GHZ	37.40	GC17044 GHZ	50.00	HP33644A-HO1	125.00
HP5082-0112	14.20	HP5082-0241	75.60	HP5082-0253	105.00	HP5082-0320	58.00
HP5082-0375	POR	HP5082-0386	POR	HP5082-0401	POR	HP5082-0438	POR
HP5082-1028	POR	HP5082-1332	POR	HP5082-2254	POR	HP5082-2302	10.70
HP5082-2303	5.20	HP5082-2696	POR	HP5082-2711	23.15	HP5082-2727	POR
HP5082-2800	1.00	HP5082-2805	4.45	HP5082-2835	1.00	HP5082-2884	POR
HP5082-3039	6.70	HP5082-3040	36.00	HP5082-3080	2.00	HP5082-3188	1.00
HP5082-3379	1.50	HP5082-6459	POR	HP5082-6462	POR	HP5082-6888	POR
HP5082-8016	POR	HP5082-8323	POR	K3A Kemtron	7.00	MA450A	POR
MA475	POR	MA40008	POR	MA41487	POR	MA41765	POR
MA41766	POR	MA43004	48.00	MA43589	POR	MA43622	POR
MA43636	POR	MA45104	27.00	MA47044	POR	MA47051	25.50
MA47100	3.05	MA47202	30.80	MA47771	POR	MA47838*	POR
MA47852	POR	MA49106	37.95	MA49558	POR	MA86731	125.00

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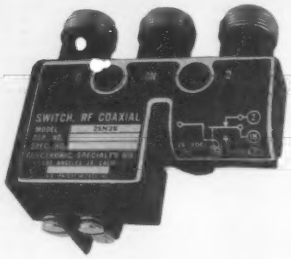
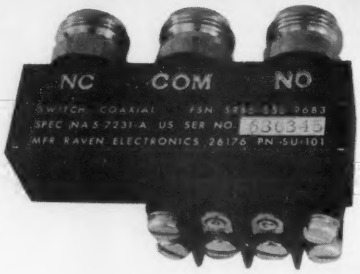
COAXIAL RELAY SWITCHES SPDT

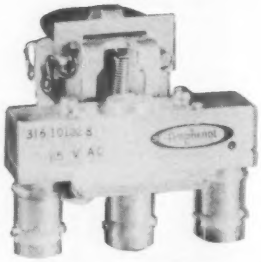
Electronic Specialty Co./Raven Electronics FSN 5985-556-9683 $49.00
Part # 25N28 Part # SU-01
26Vdc Type N Connector, DC to 1 GHz.





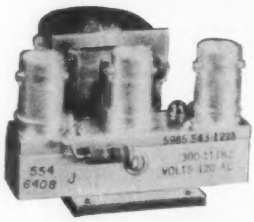
Amphenol
Part # 316-10102-8
115Vac Type BNC DC to 3 GHz.

$29.99



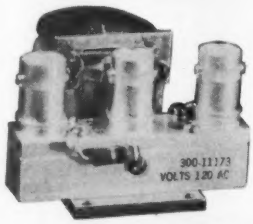
FXR
Part # 300-11182
120Vac Type BNC DC to 4 GHz.
FSN 5985-543-1225

$39.99



FXR
Part # 300-11173
120Vac Type BNC Same
FSN 5985-543-1850

$39.99



BNC To Banana Plug Coax Cable RG-58 36 inch or BNC to N Coax Cable RG-58 36 inch.

$7.99 or 2 For $13.99 or 10 For $50.00 $8.99 or 2 For $15.99 or 10 For $60.00

SOLID STATE RELAYS

P&B Model ECT1DB72 PRICE EACH $5.00	5vdc turn on	120vac contact at 7amps or 20amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.
Digisig, Inc. Model ECS-215 PRICE EACH $7.50	5vdc turn on	240vac contact 14amps or 40amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.
Grigsby/Barton Model GB7400 PRICE EACH $7.50	5vdc turn on	240vac contact at 15amps or 40amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.

NOTE: *** Items may be substituted with other brands or equivalent model numbers. ***

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RECALL PHONE MEMORY TELEPHONE WITH 24 NUMBER AUTO DIALER

The Recall Phone Telephone employs the latest state of art communications technology.It is a combination telephone and automatic dialer that uses premium-quality,solid-state circuitry to assure high-reliability performance in personal or business applications. $49.99

ARON ALPHA RAPID BONDING GLUE

Super Glue #CE-486 high strength rapid bonding adhesive.Alpha Cyanoacrylate.Set-Time 20 to 40 sec.,0.7fl.oz.(20gm.)
$2.00

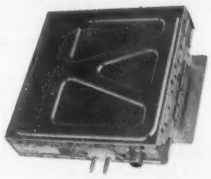
TOUCH TONE PAD

This pad contains all the electronics to produce standard touch-tone tones. New with data.

$9.99 or 10/$89.99

MITSUMI UHF/VHF VARACTOR TUNER MODEL UVE1A

Perfect for those unscrambler projects. New with data.



$19.99 or 10/$149.99

INTEGRATED CIRCUIT.		1 to 10	11up
MC1372P	Color TV Video Modulator Circuit.	$ 4.42	$2.95
MC1358P	IF Amp.,Limiter,FM Detector,Audio Driver,Electronic Attenuator.	5.00	4.00
MC1350P	IF Amplifier	1.50	1.25
MC1330A1P	Low Level Video Detector	1.50	1.15
MC1310P	FM Stereo Demodulator	4.29	3.30
MC1496P	Balanced Modulator/Demodulator	1.50	1.25
LM565N	Phase Locked Loop	2.50	2.00
LM380N14	2Watt Audio Power Amplifier	1.56	1.25
LM1889N	TV Video Modulator	5.00	4.00
NE564N	Phase Locked Loop	10.00	8.00
NE561N	Phase Locked Loop	10.00	8.00

FERRANTI ELECTRONICS AM RADIO RECEIVER MODEL ZN414 INTEGRATED CIRCUIT.
Features:
1.2 to 1.6 volt operating range.,Less than 0.5ma current consumption. 150KHz to 3MHz Frequency range.,Easy to assemble,no alignment necessary. Effective and variable AGC action., Will drive an earphone direct. Excellent audio quality.,Typical power gain of 72dB.,TO-18 package. With data. $2.99 or 10 For $24.99

NI CAD RECHARGEABLE BATTERIES

AA Battery Pack of 6 These are Factory New. $5.00

SUB C Pack of 10 2.5Amp/Hr. $10.00

Gates Rechargeable Battery Packs

12vdc at 2.5Amp/Hr. $11.99
12vdc at 5Amp/Hr. $15.99

MOTOROLA MRF559 RF TRANSISTOR

hfe 30min 90typ 200max.
ft 3000mhz
gain 8db min 9.5typ at 870mhz
13db typ at 512mhz
output power .5watts at 12.5vdc at 870mhz.

$2.05 or 10/$15.00

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"SOCKETS AND CHIMNEYS"

EIMAC TUBE SOCKETS AND CHIMNEYS

SK110	Socket	$POR
SK300A	Socket For 4CX5000A,R,J, 4CX10,000D, 4CX15,000A,J	$520.00
SK400	Socket For 4-125A,250A,400A,400C,4PR125A,400A,4-500A,5-500A	260.00
SK406	Chimney For 4-250A,400A,400C,4PR400A	74.00
SK416	Chimney For 3-400Z	36.00
SK500	Socket For 4-1000A/4PR1000A/B	390.00
SK600	Socket For 4CX250B,BC,FG,R,4CX350A,F,FJ	51.00
SK602	Socket For 4CX250B,BC,FG,R,4CX350A,F,FJ	73.00
SK606	Chimney For 4CX250B,BC,FG,R,4CX350A,F,FJ	11.00
SK607	Socket For 4CX600J,JA	60.00
SK610	Socket For 4CX600J,JA	60.00
SK620	Socket For 4CX600J,JA	66.00
SK626	Chimney For 4CX600J,JA	10.00
SK630	Socket For 4CX600J,JA	66.00
SK636B	Chimney For 4CX600J,JA	34.00
SK640	Socket For 4CX600J,JA	36.00
SK646	Chimney For 4CX600J,JA	71.00
SK700	Socket For 4CX300A,Y,4CX125C,F	225.00
SK711A	Socket For 4CX300A,Y,4CX125C,F	225.00
SK740	Socket For 4CX300A,Y,4CX125C,F	86.00
SK770	Socket For 4CX300A,Y,4CX125C,F	86.00
SK800A	Socket For 4CX1000A,4CX1500B	225.00
SK806	Chimney For 4CX1000A,4CX1500B	40.00
SK810	Socket For 4CX1000A,4CX1500B	225.00
SK900	Socket For 4X500A	300.00
SK906	Chimney For 4X500A	57.00
SK1420	Socket For 5CX3000A	650.00
SK1490	Socket For 4CV8000A	585.00

JOHNSON TUBE SOCKETS AND CHIMNEYS

124-111/SK606	Chimney For 4CX250B,BC,FG,R, 4CX350A,F,FJ	$ 10.00
122-0275-001	Socket For 3-500Z, 4-125A, 250A, 400A, 4-500A, 5-500A	(pair)15.00
124-0113-00	Capacitor Ring	15.00
124-116/SK630A	Socket For 4CX250B,BC,FG,R, /4CX350A,F,FJ	55.00
124-115-2/SK620A	Socket For 4CX250B,BC,FG,R, /4CX350A,F,FJ	55.00
	813 Tube Socket	20.00

TUBE CAPS (Plate)

HR1, 4	$11.00
HR2,3, 6 & 7	13.00
HR5, 8	14.00
HR9	17.00
HR10	20.00

CHIP CAPACITORS

.8pf	10pf	100pf*	430pf
1pf	12pf	110pf	470pf
1.1pf	15pf	120pf	510pf
1.4pf	18pf	130pf	560pf
1.5pf	20pf	150pf	620pf
1.8pf	22pf	160pf	680pf
2.2pf	24pf	180pf	820pf
2.7pf	27pf	200pf	1000pf/.001uf*
3.3pf	33pf	220pf*	1800pf/.0018uf
3.6pf	39pf	240pf	2700pf/.0027uf
3.9pf	47pf	270pf	10,000pf/.01uf
4.7pf	51pf	300pf	12,000pf/.012uf
5.6pf	56pf	330pf	15,000pf/.015uf
6.8pf	68pf	360pf	18,000pf/.018uf
8.2pf	82pf	390pf	

PRICES: 1 to 10 - .99¢ 101 to 1000 .60¢ * IS A SPECIAL PRICE: 10 for $7.50
11 to 50 - .90¢ 1001 & UP .35¢ 100 for $65.00
51 to 100 - .80¢ 1000 for $350.00

WATKINS JOHNSON WJ-V907: Voltage Controlled Microwave Oscillator $110.00

Frequency range 3.6 to 4.2GHz, Power ouput, Min. 10dBm typical, 8dBm Guaranteed. Spurious output suppression Harmonic (nf_0), min. 20dB typical, In-Band Non-Harmonic, min. 60dB typical, Residual FM, pk to pk, Max. 5KHz, pushing factor, Max. 8KHz/V, Pulling figure (1.5:1 VSWR), Max. 60MHz, Tuning voltage range +1 to +15volts, Tuning current, Max. -0.1mA, modulation sensitivity range, Max. 120 to 30MHz/V, Input capacitance, Max. 100pf, Oscillator Bias +15 +-0.05 volts @ 55mA, Max.

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TUBES

TYPE	PRICE	TYPE	PRICE	TYPE	PRICE
2C39/7289	$ 34.00	1182/4600A	$500.00	ML7815AL	$ 60.00
2E26	7.95	4600A	500.00	7843	107.00
2K28	200.00	4624	310.00	7854	130.00
3-500Z	102.00	4657	84.00	ML7855KAL	125.00
3-1000Z/8164	400.00	4662	100.00	7984	14.95
3B28/866A	9.50	4665	500.00	8072	84.00
3CX400U7/8961	255.00	4687	P.O.R.	8106	5.00
3CX1000A7/8283	526.00	5675	42.00	8117A	225.00
3CX3000F1/8239	567.00	5721	250.00	8121	110.00
3CW30000H7	1700.00	5768	125.00	8122	110.00
3X2500A3	473.00	5819	119.00	8134	470.00
3X3000F1	567.00	5836	232.50	8156	12.00
4-65A/8165	69.00	5837	232.50	8233	60.00
4-125A/4D21	79.00	5861	140.00	8236	35.00
4-250A/5D22	98.00	5867A	185.00	8295/PL172	500.00
4-400A/8438	98.00	5868/AX9902	270.00	8458	35.00
4-400B/7527	110.00	5876/A	42.00	8462	130.00
4-400C/6775	110.00	5881/6L6	8.00	8505A	95.00
4-1000A/8166	444.00	5893	60.00	8533W	136.00
4CX250B/7203	54.00	5894/A	54.00	8560/A	75.00
4CX250FG/8621	75.00	5894B/8737	54.00	8560AS	100.00
4CX250K/8245	125.00	5946	395.00	8608	38.00
4CX250R/7580W	90.00	6083/AZ9909	95.00	8624	100.00
4CX300A/8167	170.00	6146/6146A	8.50	8637	70.00
4CX350A/8321	110.00	6146B/8298	10.50	8643	83.00
4CX350F/8322	115.00	6146W/7212	17.95	8647	168.00
4CX350FJ/8904	140.00	6156	110.00	8683	95.00
4CX600J/8809	835.00	6159	13.85	8877	465.00
4CX1000A/8168	242.50*	6159B	23.50	8908	13.00
4CX1000A/8168	485.00	6161	325.00	8950	13.00
4CX1500B/8660	555.00	6280	42.50	8930	137.00
4CX5000A/8170	1100.00	6291	180.00	6L6 Metal	25.00
4CX10000D/8171	1255.00	6293	24.00	6L6GC	5.03
4CX15000A/8281	1500.00	6326	P.O.R.	6CA7/EL34	5.38
4CW800F	710.00	6360/A	5.75	6CL6	3.50
4D32	240.00	6399	540.00	6DJ8	2.50
4E27A/5-125B	240.00	6550A	10.00	6DQ5	6.58
4PR60A	200.00	6883B/8032A/8552	10.00	6GF5	5.85
4PR60B	345.00	6897	160.00	6GJ5A	6.20
4PR65A/8187	175.00	6907	79.00	6GK6	6.00
4PR1000A/8189	590.00	6922/6DJ8	5.00	6HB5	6.00
4X150A/7034	60.00	6939	22.00	6HF5	8.73
4X150D/7609	95.00	7094	250.00	6JG6A	6.28
4X250B	45.00	7117	38.50	6JM6	6.00
4X250F	45.00	7203	P.O.R.	6JN6	6.00
4X500A	412.00	7211	100.00	6JS6C	7.25
5CX1500A	660.00	7213	300.00*	6KN6	5.05
KT88	27.50	7214	300.00*	6KD6	8.25
416B	45.00	7271	135.00	6LF6	7.00
416C	62.50	7289/2C39	34.00	6LQ6 G.E.	7.00
572B/T160L	49.95	7325	P.O.R.	6LQ6/6MJ6 Sylvania	9.00
592/3-200A3	211.00	7360	13.50	6ME6	8.90
807	8.50	7377	85.00	12AT7	3.50
811A	15.00	7408	2.50	12AX7	3.00
812A	29.00	7609	95.00	12BY7	5.00
813	50.00	7735	36.00	12JB6A	6.50

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"FILTERS"

COLLINS Mechanical Filter #526-9724-010 MODEL F455Z32F

455KHZ at 3.2KHz wide. May be other models but equivalent. May be used or new. $15.99

ATLAS Crystal Filters

5.595-2.7/8/LSB, 5.595-2.7/LSB
8 pole 2.7KHz wide Upper sideband. Impedence 800ohms 15pf In/800ohms 0pf out. 19.99

5.595-2.7/8/U, 5.595-2.7/USB
8 pole 2.7Khz wide Upper sideband. Impedence 800ohms 15pf In/800ohms 0pf out. 19.99

5.595-.500/4, 5.595-.500/4/CW
4 pole 500 cycles wide CW. Impedance 800ohms 15pf In/800ohms 0pf out. 19.99

9.0USB/CW
6 pole 2.7KHz wide at 6dB. Impedance 680ohms 7pf In/300ohms 8pf out. CW-1599Hz 19.99

KOKUSAI ELECTRIC CO. Mechanical Filter #MF-455-ZL/ZU-21H

455KHz at Center Frequency of 453.5KC. Carrier Frequency of 455KHz 2.36KC Bandwidth.
Upper sideband. (ZU) 19.99
Lower sideband. (ZL) 19.99

****

CRYSTAL FILTERS

NIKKO	FX-07800C	7.8MHz	$10.00
TEW	FEC-103-2	10.6935MHz	10.00
SDK	SCH-113A	11.2735MHz	10.00
TAMA	TF-31H250	CF 3179.3KHz	19.99
TYCO/CD	001019880	10.7MHz 2pole 15KHz bandwidth	5.00
MOTOROLA	4884863B01	11.7MHz 2pole 15KHz bandwidth	5.00
PTI	5350C	12MHz 2pole 15KHz bandwidth	5.00
PTI	5426C	21.4MHz 2pole 15KHz bandwidth	5.00
PTI	1479	10.7MHz 8pole bandwidth 7.5KHz at 3dB, 5KHz at 6dB	20.00
COMTECH	A10300	45MHz 2pole 15KHz bandwidth	6.00
FRC	ERXF-15700	20.6MHz 36KHz wide	10.00
FILTECH	2131	CF 7.825MHz	10.00

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CERAMIC FILTERS

AXEL	4F449	12.6KC Bandpass Filter 3dB bandwidth 1.6KHz from 11.8-13.4KHz	10.00
CLEVITE	TO-01A	455KHz+-2KHz bandwidth 4-7% at 3dB	5.00
	TCF4-12D36A	455KHz+-1KHz bandwidth 6dB min 12KHz, 60dB max 36KHz	10.00
MURATA	BFB455B	455KHz	2.50
	BFB455L	455KHz	3.50
	CFM455E	455KHz +-5.5KHz at 3dB , +-8KHz at 6dB , +-16KHz at 50dB	6.65
	CFM455D	455KHz +-7KHz at 3dB , +-10KHz at 6dB , +-20KHz at 50dB	6.65
	CFR455E	455KHz +-5.5KHz at 3dB , +-8KHz at 6dB , +-16KHz at 60dB	8.00
	CFU455B	455KHz +-2KHz bandwidth +-15KHz at 6dB, +-30KHz at 40dB	2.90
	CFU455C	455KHz +-2KHz bandwidth +-12.5KHz at 6dB , +-24KHz at 40dB	2.90
	CFU455G	455KHz +-1KHz bandwidth +-4.5KHz at 6dB , +-10KHz at 40dB	2.90
	CFU455H	455KHz +-1KHz bandwidth +-3KHz at 6dB , +-9KHz at 40dB	2.90
	CFU455I	455KHz +-1KHz bandwidth +-2KHz at 6dB , +-6KHz at 40dB	2.90
	CFW455D	455KHz +-10KHz at 6dB , +-20KHz at 40dB	2.90
	CFW455H	455KHz +-3KHz at 6dB , +-9KHz at 40dB	2.90
	SFB455D	455KHz	2.50
	SFD455D	455KHz +-2KHz , 3dB bandwidth 4.5KHz +-1KHz	5.00
	SFE10.7MA	10.7MHz 280KHz +-50KHz at 3dB , 650KHz at 20dB	2.50
	SFE10.7MS	10,7MHz 230KHz +-50KHz at 3dB , 570KHz at 20dB	2.50
	SFG10.7MA	10.7MHz	10.00
NIPPON	LF-B4/CFU455I	455KHz +-1KHz	2.90
	LF-B6/CFU455H	455KHz +-1KHz	2.90
	LF-B8	455KHz	2.90
	LF-C18	455KHz	10.00
TOKIN	CF455A/BFU455K	455KHz +-2KHz	5.00
MATSUSHIRA	EFC-L455K	455KHz	7.00

****

SPECTRA PHYSICS INC. Model 088 HeNe LASER TUBES

POWER OUTPUT 1.6MW. BEAM DIA. .75MM BEAM DIR. 2.7MR 8KV STARTING VOLTAGE DC
68K OHM 1WATT BALLAST 1000VDC +-100VDC At 3.7MA $59.99

ROTRON MUFFIN FANS Model MARK4/MU2A1

115 VAC 14WATTS 50/60CPS IMPEDENCE PROTECTED-F 88CFM at 50CPS $ 7.99
105CFM at 60CPS THESE ARE NEW

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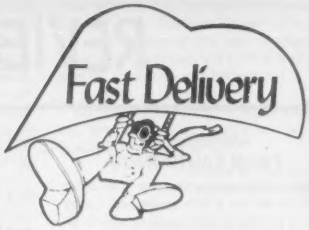

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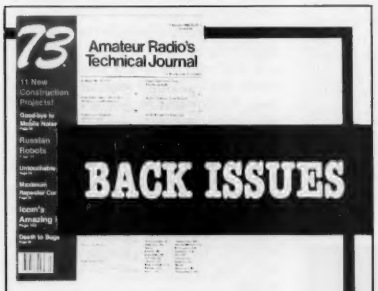

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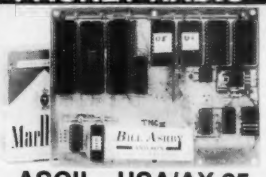

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REVIEW

AMTORSOFT FROM KANTRONICS

All the talk over the past year or so about AMTOR left me a little bewildered. I even did my homework and looked up several articles on the subject to see if I could teach my Commodore computers how to speak AMTOR. About all I accomplished was to get myself totally confused! Modes of transmission that I can't decode bug me until I understand them. AMTOR is no exception.

I was relieved when Kantronics agreed to let me take a look at their AMTORSOFT program. Finally, I would find out what all that "chirping" is about!

The AMTORSOFT package works in conjunction with your home computer and a terminal unit or computer interface. The particular package I reviewed was designed for the VIC-20 and the Kantronics Interface II.

Throwing caution to the wind, I did what any self-respecting amateur would do. I hooked up the interface, did a system call to activate the software, and threw the instruction book on the bench! *That* was not a good idea!

The Kantronics folks had enough insight to include not only a very thorough instruction manual for the software, but also an overview of AMTOR itself for the uninitiated like me. Unless you have actually seen AMTOR work, please read the book first.

My previous reading about AMTOR had taught me that there are two forms of transmission: Mode B (the broadcast mode) is the form developed for transmission of general-interest bulletins and such. In Mode B, the signal sounds very similar to ASCII transmissions. No chirping takes place. What I hadn't read was that other than for ARRL bulletins, almost no one ever uses it!

I mistakenly selected mode B from the software menu and was disappointed that I could never seem to make anything print. That was my first hint that I should read the instructions.

I finally figured out that I needed to be in the L or listener mode if I wanted to eavesdrop on AMTOR conversations. The AMTORSOFT package provides you with several software LEDs, as I choose to call them, to let you know when you are successfully locked to an AMTOR signal. These indicators are labeled L, V, X, and I. A solid block displayed below the L indicates that you are locked or in synch with an AMTOR signal. The battle is half won! The V indicates that you are receiving valid AMTOR characters. The block below the X only comes on when you are transmitting, and the I block flickers on from time to time to indicate that the station you are receiving is sending idle characters—something like RTTY diddle.

After some patience and learning the hard way that it may take ten or more seconds for even a properly-tuned signal to lock, I started seeing my first AMTOR copy.

For those of you totally unfamiliar with AMTOR (or who are like me and forget everything you read), suffice it to say that the transmissions occur in three-character blocks. If a block is received OK, the next three-character block is sent. If the receiving station doesn't acknowledge that a valid block has been received, then the transmitting station keeps sending it until it is acknowledged. With that in mind, consider what happens when you eavesdrop on a conversation.

Since you are not an active participant in the QSO, you have no way of telling the transmitting station whether you have received the information or not. This can result in some strange copy at your end. Let's say the transmitting station is sending: K9EI K9EI DE WB9YJC WB9YJC. Suppose that just as the transmission begins, a bad static crash wipes out the first three characters for the intended station, but doesn't affect your reception. If it takes three tries before the intended station acknowledges those first three characters, and then everything goes smoothly, your screen might look like this: K9EK9EK9EI K9EI DE WB9YJC WB9YJC.

If during the transmission you receive invalid or no information, your screen will simply remain blank until the next valid set of characters is received.

The next problem I encountered was that of stations calling CQ. To put it simply, they don't! Not in the traditional way, at any rate.

Old-time RTTY people may be familiar with selcal or selective calling. On mechanical machines, it is possible to program an on/off sequence that will respond to a certain four-letter code. For general purposes, NNNN is frequently used. On AMTOR, a similar system is used. A station wishing to call CQ will continually transmit a four-letter block which sometimes consists of CQCQ or perhaps a shortened form of the originating station's callsign. For example, I might use KKEI or WYJC. A receiving station can lock to this selcal and respond only when this particular code is seen. The AMTORSOFT package will display this selcal for you so that if you desire, you can lock to the transmitting station. Entering a null character group will lock to any received selcal.

In fairness, I must say that on my second day of operation, I did find that some stations use the B mode and actually do send CQ, but the majority simply start up with the CQCQ selcal. In such a case, the locked and valid indicators will come on, but your screen will print nothing. A word to those operators calling CQ in this manner (who I heard go on for 30 minutes or more without ever sending an ID). You better watch out. Though CW ID is no longer required, you do have to identify, and your four-character selcal won't meet the requirement.

Actual two-way QSOs with AMTORSOFT can be a joy once the initial contact is established. Due to requests for repeats on character groups, a normal AMTOR QSO speeds along at about the same rate as 60-wpm RTTY. If a lot of repeats are necessary, the QSO can go slowly, but quite accurately.

Something that must be contemplated when setting up your station for AMTOR is the switching time of your transceiver between transmit and receive. Most modern transceivers will work well, but if you are not sure, check before you buy.

Another problem I had not considered is that most power amplifiers cannot respond quickly enough to meet the AMTOR timing requirements. The instructions with AMTORSOFT state boldly that operation with a linear should not be attempted.

That certainly explains that while I could find some very strong RTTY signals on 20 meters, all of the AMTOR transmissions were down 12 dB or more. Everyone is running in the 50-Watt or so range!

A beautiful example of how effective AMTOR can be is a QSO I monitored between an east-coast station and a maritime mobile station off the coast of South America. Both were using the AMTORSOFT package. The QSO began with both stations at about 50 Watts. Both stations kept reducing power until each was running under five Watts. From my listening, it was apparent that the QSO was solid with a minimum of repeats. Anybody want to try for an AMTOR QSO using an HW-8?

I finally did get to copy the W1AW bulletins on mode B. Of course there is no allowance for feedback to the transmitting station, so each group of characters is sent twice. The software determines whether one of the character blocks received is valid and prints only the valid one. If invalid data is received both times, garbage is not printed—rather blank spaces are sent to the screen or printer. During an approaching thunderstorm, my copy of the bulletins was nearly letter perfect, with only three blank spots during the whole 30-minute transmission. The Teletype® bulletins at the same time were a disaster.

AMTORSOFT has all of the text-holding and editing features of HAMTEXT, the CW/RTTY/ASCII package available from Kantronics. Those features have been detailed in several reviews elsewhere, so I won't go into them here. The software contains the equivalent of a mini word processor and will allow you to store received messages in a buffer, save them to disk or to tape, edit, and resend them.

The AMTORSOFT package receives and sends AMTOR only, though Kantronics has a special version of HAMTEXT with AMTOR that combines both packages.

It seems to me that AMTOR is a godsend for the serious QRP enthusiast who is interested in doing RTTY-type things. AMTORSOFT is just another in a string of excellent software packages from Kantronics, priced at $89.95 list. It is highly recommended.

For further details, contact *Kantronics, 1202 East 23rd Street, Lawrence KS 66044.*

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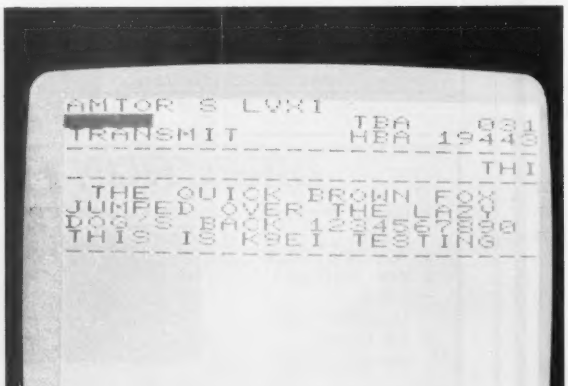


The AMTORSOFT screen as generated by a VIC-20. Note in particular the dark rectangle in the upper left hand corner for displaying selcal. The software LEDs (LVXI) are located just above and to the right of the selcal block.

AEA MBATEXT SOFTWARE

The power of computer world processing has come to amateur radio! The AEA software packages for the VIC-20 and Commodore 64 computers offer a very versatile approach to several modes of amateur transmission.

Known as MBATEXT for Morse, Baudot, ASCII, these software packages transform your Commodore computer into a state-of-the-art communications terminal. There are so many features included in MBATEXT that it is difficult to find a starting point.

MBATEXT comes as a plug-in cartridge, much like the ones used for computer games. In order to access the program, a SYS (system) command is used. This allows you to call the program from your own Basic program. If, for example, you wish to use other than the default screen and text colors, you can write a brief program to set them to your own choices and then call MBATEXT.

Once you have entered the program, everything is menu-driven. You are presented with several choices from the main menu. As you make selections, you may encounter additional detailed menus at any time. Before concentrating on the operation of MBATEXT for transmission and reception, let's look at the common text-editing system.

Those of you familiar with regular word processing would expect a program to provide several different functions. First, you should be able to enter text on the screen and edit it to correct mistakes. Second, you should be able to save and load text files to and from cassette and disk. Finally, you should have the ability to print your file.

MBATEXT does all of this and much more! The text storage area has been designed with several different buffers. The size of these buffers is user-selectable up to the limit of available memory.

Ten buffers are available for programmed messages of your choice. These messages can be saved to tape or disk so that you can reload them when you first start the program. Incoming text, whether it be CW, RTTY, or ASCII can be saved in a receive buffer. It is possible to use the text editor to revise the text so that you can print or save just exactly the parts you want. Someone active in traffic handling can use this feature to great advantage, eliminating the need to manually transcribe and resend messages.

An audible "keyclick" is available if de-

sired to give you an indication that you actually have hit a key on the keyboard. Many operators find that this improves the accuracy of their typing.

Regardless of the mode you are operating, a transmit buffer is available so that you can compose an outgoing message while you are receiving messages. Even when you are on line and sending, you can type ahead of the text being sent. That's a real advantage when you are sending at slower CW speeds.

In the CW mode, you can select speeds up to 99 words per minute. It is really only necessary to set the transmitting speed; the receive speed will track the incoming signal automatically. It is really something to watch the speed indicator track the W1AW code-practice transmissions.

The screen is split into three sections: received text, transmit buffer, and a single line of outgoing text.

When MBATEXT is fed a signal from a compatible interface such as the AEA CP-1, it does an excellent job of receiving. CW transmission is very clean with perfect machine-generated code. At speeds between 5 and 14 words per minute, Farnsworth spacing is used. Individual characters are sent at about 15 words per minute with the spacing between characters increased to slow down the overall rate.

Several additional options are available. You have the choice of character or word mode on transmit. By selecting the word mode, transmission is held up until a space is encountered, and then the whole word is sent. That's particularly helpful for two-finger typists who make a lot of mistakes. Your errors can be corrected before they are sent!

You also have the option of selecting the break-in mode. The program automatically toggles between send and receive. What you lose is the use of the transmit holding buffer.

A Morse-code fill option can be selected. It is the Morse-code equivalent of RTTY diddle (sending null characters). If selected, the program will automatically send BT while you try to think of something to say. I didn't find that option very worthwhile.

Most of the features for RTTY and ASCII are similar since they are similar modes of transmission. Standard RTTY speeds of 60, 67, 75, 100, and 132 words per minute are included with ASCII speeds of 110 and 300 baud.

An unshift on space (USOS) option is available and can be handy when copying weak signals. One particularly nice touch is the RTTY "speed guess" mode. If you aren't sure at what speed the RTTY is being sent, this can be used to get you in the ball park. It isn't foolproof. Usually the average of several guesses gets you close.

AEA has included several keyboard overlays to help you keep track of what the function keys do, what you have stored in your message buffers, as well as where to find the special characters. It sure beats checking the instruction manual every time you forget.

MBATEXT will support printing to either a VIC-type printer (1525, 1526, MPS 801, etc.) or a Centronics-type parallel printer. A time-of-day clock at the top of the screen keeps you on schedule.

Operation with MBATEXT is a pleasure. Old-time RTTY tape splicers will find it to be the greatest thing since the spark gap.

AEA offers one-year support on the software that is even transferable should you decide to sell MBATEXT before the warranty is expired. MBATEXT is state-of-the-art software that would be a welcome addition in any hamshack.

For AMTOR enthusiasts, AEA offers MBATOR—which includes all the features of MBATEXT plus AMTOR, along with some additional MBA features.

For more information, contact *Advanced Electronic Applications, PO Box C-2160, Lynnwood WA 98036.*

Jim Grubbs K9EI
Springfield IL 62708

TIMEX/SINCLAIR 1000: ASTRONOMY ON YOUR COMPUTER

This book (by Burgess and Burgess) might, on the surface, seem like a pretty strange topic for an amateur-radio publication. However, the computer programs presented in the 17 chapters of this little text have a lot to offer amateurs. But first things first. The book is published by Sybex, Inc., 2344 Sixth St., Berkeley CA 94710, and is 176 pages. (You can check on the current price with Sybex—it is modest.) Sybex offers a companion text that presents a collection of astronomical programs in Basic which are adaptable to a wide range of computers. It is *Celestial Basic*, by Eric Burgess (300 pages). The latter may interest hams with computers other than the Timex/Sinclair models.

Several chapters in the *Timex/Sinclair Astronomy* text are sure to interest amateurs. Chapter 2 presents a program that converts local time to sidereal or sidereal to local mean time. Chapter 7 has a program for the right ascension and declination of the moon. Chapter 8 computes the time of rising, transit, and setting of the moon. All of these programs are sure to interest moonbounce fans. A nice touch found in every program is the ability to set the latitude and longitude for your own QTH or for any other location on Earth. This would be a big help in coordinating schedules with other hams, since you can use the computer to search for common windows.

Chapter 15 has an interesting program for DX fans. It provides a method of computing the time of rising, transit, and setting of the sun. This will help in the identification of local conditions as well as those of a DX location on any selected date. Using the program, you can identify sunrise and sunset periods in the search for openings.

The rest of the text has a lot to offer for non-ham applications as well. There are programs to help identify constellations. One shows the location of the sun, moon, and planets at any time on any date. Another helps select the exposure for photographing astronomical objects. All in all, this is a very useful text.

The authors have done a very good job in presenting their programs in a clear and readable fashion. The output from sample runs is presented to clarify the goals of each program. Surprise—there is even an index—something that is left out of far too many low-cost computer books (and some no-so-low-cost books, too).

My overall evaluation of the text is highly complimentary. The book should appeal to hams with a general interest in relating astronomy to their ham activities. The text will be fascinating to those of us who find astronomy interesting in its own right. One caution—the programs are long and you must have at least 16K of memory to make them fit. There should be no problem in the conversion to other machines, for those interested.

Finally, there is one minor feature that I would like to have seen in the Sybex text, as well as in other books. I wish that the publishers had used a spiral binding. I have to hold one side down with my D-104 and the other with my Ten-Tec keyer. Otherwise I lose the page. Come on Sybex—let's be more considerate of the poor computer owner who has to hunt and peck as well as hold the book down with both elbows.

For more information, contact *Sybex, Inc., 2344 Sixth Street, Berkeley CA 94710.* Reader Service Number 482.

Thomas M. Hart AD1B
Westwood MA 02026

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

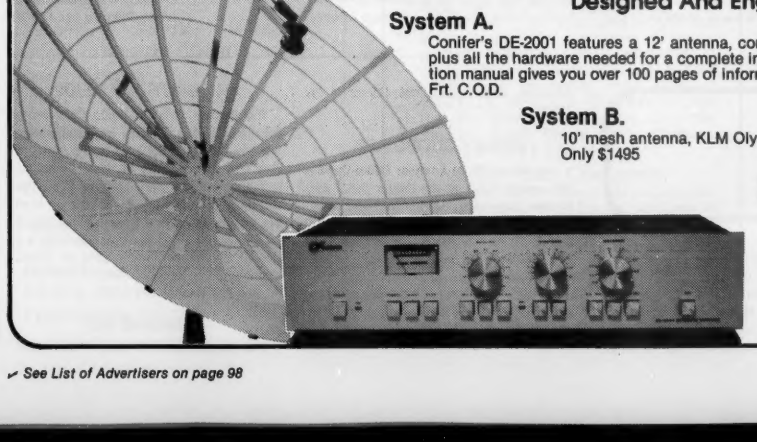
WHAT DO YOU THINK? ICOM 751 AND KENWOOD TR-2500

In December, 1983, you printed a very brief review on the Icom 751. I bought mine in March, 1984, after looking at all the competition. The review was very conservative at best. The radio is the greatest HF rig for the money that I have seen in years. By removing 1 wire (mute), it covers MARS and CAP use also. It took me two days of reading the manual to really become proficient with all its capabilities. I worked LU5AMF on 20 barefoot from my QTH in northern Japan—that's 17,000 km and pretty good considering my antenna is a HyGain 18AVT/WB vertical. Critical notes: S1 and S2 on the main board are for RTTY polarity and shift, respectively, but are inside the rig! I hope Icom will correct that and put them where they are readily available. I use the PS35 internal supply and 500-Hz FL-52 filter with it. It works great on RTTY also. If you need a good, small, neat HF radio for amateur, MARS, mobile, and RTTY, I think the 751 is just the rig.

In June, 1982, you reviewed the Kenwood TR-2500 and 3 months later I bought one. I have used mine in all kinds of weather (lots of snow and ice) and it works like a champ. It has been dropped on ice and concrete and it keeps right on working. I wrote to Kenwood and purchased the service manual at a reasonable price. To my surprise, the manual covers all the accessories, too. Critical comment: The speaker mike connector easily works loose and you have to keep pushing in the plug (which was not appreciated when I was hanging from a 60-ft. pole working on the repeater antenna). The TR-2500 will be a hard HT to beat for the money with the versatility that it has.

The above are the only two new radios that I have bought in over 17 years. I am very picky about what ham radios I buy. Now if I could only decide about what computer to buy.

MSgt. Robert S. Burch WA2ILU
APO SF 96519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LETTERS

OLYMPIC TRIUMPH

When the US Olympic Committee selected Olympia, Washington, to be the site of the US Olympic Women's Marathon Trials on May 12th, 1984, the local amateur radio club, the Olympia Amateur Radio Society (OARS), created a committee to interface with the task force running the marathon. As chairman of this committee, I found this assignment quite difficult for several reasons. Our job was to teach the marathon task force about amateur radio's utility in this kind of endeavor, find out what they would need, create a structure to provide the services required, and direct whatever communications effort was needed. The Women's Marathon Task Force was divided into about fifteen committees, and getting them to understand our unique communications capabilities was very difficult.

The task force's assessment was that there might be 100,000 people trying to view the event, and they did their planning on that basis. Olympia is a relatively small town and there was no way 100k people could see the finish or even see the last few miles of the race. The task force also did not know what events they would host for the runners prior to and after the race itself, what demands the media would make of them, how much support they could get from the community, how they would handle traffic...their assignment was incredible.

After a great deal of study, the marathon task force directors determined that their greatest need for our services would be during the race itelf, to provide to the race announcer and to the various media the position and time information on the progress of the race. (We might also have been assigned course security duty, but the US Olympic Committee was sending a 500-MHz Motorola system with 40 handhelds and a base station of the type to be used during the summer Olympics. This Motorola system and the State Patrol, Sheriff, and City Police systems would be the backbone of their security system.)

Initially, we planned to provide position and "splits" (time since the race began) for the race announcer and records people at each milepost of the 26.2-mile course. That would have meant 25 hams and timers on the course, plus net controls at the finish line. That was easy. However, a few weeks before the event we were asked if we could enlarge the system to also provide information from 1/2-mile points, from the the mid-race point, from the 1-mile-to-the-end point, and could we put someone in the pace car and on the ABC-TV truck? Also, could we put operators in the ABC-TV vans at the starting line (to remotely start 25 timers' watches at all of the 25 mile-markers), and in the Thurston County Communications Center (Medic-1, 911, etc.), and "there may be a few last-minute additions..."!

The OARS Committee designed the system we would use, taking input from everyone we could find. We would have two nets, one on two meters and one on 220, both on available county-wide-coverage repeaters, and we would alternate assignments. Thus, the one-milepost operator was on two meters, the two-milepost operator was on 220, etc. There were not enough operators in the Olympia area, for our operator needs were now around 60, with each operator asked to supply a timing helper.

We called the nearby clubs, the Mason County Amateur Radio Society and the Radio Club of Tacoma, Inc., and got the needed additional people. We tried to be fair. While none of the tasks was "dirty," some might be construed to be more "glamorous" than others, and we assigned the "glamorous" tasks evenly between the three clubs.

We found that the volume of data we would be collecting was too large to handle and compile using a paperwork system, so we developed a computer system to collate and distribute the data. This system evolved into a set of Radio Shack model 4s acting as dumb terminals driven by one model 4. We ended up with a 700-foot RS-232 run at 1200 baud, working perfectly, although we had full-duplex modems if we needed them.

The marathon task force wanted the positions and times on the first eight runners and selected "ones to watch." This meant about a dozen positions and times coming to the computer typist from the two nets. The net format was carefully designed to minimize repeating data and was a near-copy of the Navy MARS format. It demanded that after each position and time was reported, the net control acknowledged that piece of information. It worked perfectly.

ABC-TV was having a considerable impact on the information the marathon task force wanted us to provide and I was having some reservations about the legality of our plans. Would we be de facto news reporters? I called the Engineer-in-Charge of the Seattle FCC field office who referred the question to an attorney in the Personal Radio Section in Washington, D.C., and we had a 3-way conference call. The attorney was most helpful, observing that our prime objective was to provide the course announcer with information and that no remuneration was coming for our services. He contended that we were OK as long as no amateurs were placed on the air broadcasting race information directly. Our data was going into a computer which was creating a delay, albeit small, and we were "grinding" on the data, adding to the number we put in from the racer's shirt, her name, creating a split time and "elapsed-time-to-finish-at-this-pace" time, for display to the announcers. The two operators assigned the ABC-TV trailers were not to transmit information requests.

The weekend before the race we held a meeting for all the amateurs who would be participating. We handed out a course-operator location sheet, a map showing the precise location of each milepost, an instruction sheet, and a timer sheet with the net format. We went over the timing process and the net reporting process. Then each operator went to his/her location to make sure he/she knew where it was and checked the radios through the repeater at that location for any dead spots. We let the assembled multitude know of a possible major change: The FCC Special Temporary Authority (STA) requested by the marathon task force allowing use of the 500-MHz radios for the security team had been disapproved...it seemed that the system might cause interference with a low-power religious TV station 40 miles away! The marathon task force had Washington State Senator Slade Gorton trying to reverse the FCC and was scrambling for unused Department of Natural Resources (fire-fighting) radios as a backup in the meantime. But—if worse came to worst—one of our nets would become the security system! As it turned out, the security team borrowed enough DNR radios to do the job, but they did not get about 6 of them back. They were left on the sidewalk by the "security" people, or "lost..."

The amateur we had assigned the task of riding with the ABC-TV camera truck reported that rf from ABC-TV's own radio system and its CB radio, in the vicinity of the truck, would make the special gyro-stabilized camera mount go bonkers. The camera crew had been working two days to try to RFI-proof the mount, and when I went to check they looked a little bedraggled. We found that the 220 Icom 3AT didn't upset the mount, and the Icom 2AT did, only slightly, when on high power and right next to the mount. Eventually the camera crew managed to seal the mount from the RFI effects, and we mounted our mag-mounts on the other end of the truck and hoped for the best.

We borrowed a new 29-foot travel trailer from a local dealer and got it into position two days before the event, with 200-Amp service. We installed a copier borrowed from another dealer as a backup in case the computer system we'd developed didn't work. The copier was never turned on! The day before the event we installed the computers and radios and did a trial of the system the night before the event.

Race day came. As the position operators checked in, it became apparent that everyone had showed up—all 60 operators were in position! The town filled with spectators. Eight helicopters and several fixed-wing planes circled overhead at the start. The ham at the start transmitted the starting gun on both 2 and 220, and the 25 timing watches were started.

The runners set a blistering pace—five and half minutes a mile or better, and as they went by the first milepost they were reported to be chatting with each other... for them it was a Saturday 26.2-mile cakewalk! Our data began coming in and went into the computer and out to the course announcer 300 feet one way, to ABC-TV 700 feet another way, to KOMO-radio 700 feet another way, and to the press area near us (we were 140 feet from the finish line).

The race took two hours, thirty-one minutes, three seconds, for its winner, Joan Benoit, but much longer for its last-place runner, who was about halfway around as Joan finished. As runners dropped out, they came to our operators with requests for aid or for trainers to pick them up. These requests we relayed to the medical community or the racers' support areas.

After the race we held a brief evaluation meeting with the race directors—who were uniformly overjoyed with our operation. ABC-TV's comments were that they had never seen such a volume of data. While they had about 17 cameras and mostly operated real-time, they were impressed with our computers and with the smoothness of our system. As a result of this and other equally fine efforts by the 2800 volunteers from all over the state, we may get to do it again...in four years!

My suggestions for anyone planning such an event are that you try to conceive the eventual system months ahead. Sit around and brainstorm. Plan for a worst-case set of circumstances. If you do an event like this, create a notebook with a page for every milepost and position, where every change can be noted. Have permission from the repeater owners in writing, in advance of the operation, and have backups for everything, including people, equipment, and systems. Overdo it if possible. Give several people the task of documenting your efforts. Assign a cleanup committee to help tear down your system after it is over. Give credit to everyone—write letters of appreciation to anyone you borrow from on the most official stationary you can get! Take all credit and all criticism with a grain of salt. Have fun, and good luck!

Lee Chambers WB7UED
1111 Archwood, #298
Olympia WA 98502

AWARDS

MT. DAVIS DXPEDITION

The Somerset County Amateur Radio Club will sponsor its third annual DXpedition to the highest point in Pennsylvania, Mt. Davis, from August 4th at 1400 EDST to August 5th at 1400 EDST.

Frequencies are the upper 25 kHz on the General portion of the bands and CW in the Novice portion, with 80 meters being used after nightfall and 40 meters during the day. Each contact wishing to receive a beautiful certificate must send a 4½" × 9" or larger envelope. Send to: Box 468, Somerset PA 15501.

JERSEY SHORE ARS

The Jersey Shore Amateur Radio Society will operate KF2T at the Oyster Creek (NJ) Nuclear Generating Station between 1400Z Saturday, August 4, and 1800Z Sunday, August 5. Phone operations will be near 3930, 7270, 14270, 21270, and 28570 kHz. CW/Novice-Tech 30 kHz from lower band edges, VHF on 146.58. RTTY on 3640, 7080, and 14080. A special photo QSL is available for an SASE to JSARS, 619 17th Avenue, South Belmar NJ 07719.

THE BIRTHDAY BEAR

The Bemidji Amateur Radio Club, using the call KC0MJ, will be commemorating Smokey the Bear's birthday at the home of Paul Bunyan and Babe the Blue Ox on August 11th and 12th, from 1400Z to 2200Z. Operating frequencies will be 10 kHz up from the lower edge of the General-class phone bands on 20, 40, and 80 meters. To receive a special tri-color certificate, send an SASE, size 9" × 12", to Bemidji Amateur Radio Club, PO Box 524, Bemidji MN 56601.

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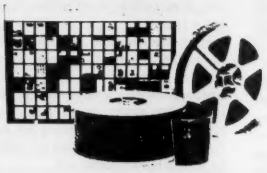

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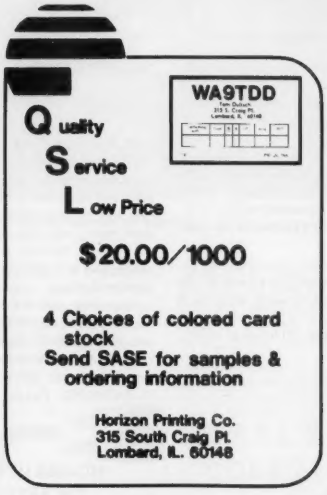

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will operate K2TM from 1500Z to 2400Z August 18–19 to celebrate the club's 21st anniversary. Frequencies: 7.235, 14.275, 21.375, 28.675, 146.520. Novice: 7.125. Certificate for large SASE and QSL via K2UFM, 31 Forest Drive, Hillsdale NJ 07642.

WAG AWARD

The Worked All GARC or WAG award is given free to any amateur-radio operator who can submit written confirmation (QSL cards) of at least one two-way contact with each of twenty (20) or more members of the Gabilan Amateur Radio Club (GARC). The award consists of an attractive certificate suitable for framing and one bulb of fresh locally-grown garlic. Contacts may be made on any band or mode or combination of these.

The Gabilan Amateur Radio Club was founded in 1979 and draws its membership from the area surrounding Gilroy CA. This includes cities in the Santa Clara, San Benito, Santa Cruz, and Monterey County areas such as Salinas, Hollister, Morgan Hill, Castroville, and San Juan Bautista. The area lies on the fringe of Silicon Valley, south of the San Francisco Bay, but its primary industry is agriculture, including the growing and processing of garlic. The city of Gilroy sponsors an annual Garlic Festival, and this award is in keeping with that spirit.

Award submissions should be sent to the GARC Secretary, PO Box 2178, Gilroy CA 95021–2178. QSL cards will be returned only if accompanied by sufficient return postage. For a current roster of GARC members, send an SASE to the GARC Secretary at the address given above. To be valid for this award, stations must be members of GARC at the time of the contact, but need not be members at the time of the award submission.

ABC RADIO CLUB

The Amateurs for Better Communications (ABC) Radio Club of northern Illinois will operate KA9KOL on August 18–19, 1984, from 1700Z to 2300Z at the site of Lindenfest 84. Lindenhurst, a northern Illinois community and part of the gateway to the lakes region, will celebrate its second annual community festival. Look for KA9KOL on 7.240 to 7.245 and/or 14.280 to 14.285. QSL SASE to Terry Drews KA9KOL, 37326 N. Fairview W Lane, Lake Villa IL 60047.

SPACE DAY '84

The Cascades Amateur Radio Society (CARS), in conjunction with the Michigan Space Center in Jackson, Michigan, is offering a Space Day certificate to all stations who work WB8CSQ during Space Day activities. Look for WB8CSQ on 3.900, 7.235, 14.285, 21.360, and 28.510 starting at 0000 GMT August 18 through 1700 August 19. A one-dollar contribution is asked to cover cost of postage and materials. Mail your log information and $1.00 to CARS, Space Day '84, PO Box 512, Jackson MI 49204.

FOX RIVER RADIO LEAGUE

The Fox River Radio League will be operating a special-event station to celebrate the FRRL's 60th year of continuous operation. The FRRL will be operating from the Kane County Fairgrounds, St. Charles, Illinois, on August 26, 1984, from 8 am until 4 pm (CDT) using the FRRL callsign W9CEQ. Suggested frequencies are 10 kHz up from the lower portions of the General-class phone bands on 40, 20, and 15 meters.

For a certificate or QSL, send your QSL and an SASE to: Fox River Radio League, PO Box 443, Aurora IL 60507.

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Model 4030 employs modern broadband circuitry instead of the highly reactive resonant networks of most field-strength meters. The element consists of a flexible receiving antenna, a single high-pass network, and a variable-gain rf amplifier/detector. A battery-saving feature turns everything off when the element is removed from the wattmeter.

Typically full-scale deflection is obtained from a one-Watt CW source at 150 MHz through a quarter-wave antenna 8 feet distant. Dynamic range is at least 30 dB, and battery life is 100 hours or more.

For further information, contact *Bird Electronic Corporation, 30303 Aurora Road, Cleveland (Solon) OH 44139*. Reader Service number 477.

MCM ELECTRONICS 1984 CATALOG

MCM Electronics, Centerville, Ohio, a parts and accessories distributor to the electronics industry, has published their 1984 catalog.

The 120-page catalog contains more than 4,500 parts and accessories. Featured are over 500 new items, including an expanded line of computer parts, new styli, and video parts. Also included are a new line of magnetrons for microwave-oven repair, new test equipment such as the Tenma 20-MHz dual-trace oscilloscope, and a large selection of Japanese semiconductors.

For a free copy of the 1984 MCM Catalog, call toll free *(800)-543-4330* (in Ohio, call *(800)-762-4315)*. For more information, contact *MCM Electronics, 858 E. Congress Park Dr., Centerville OH 45459; (513)-434-0031*. Reader Service number 480.

HD-8999 ULTRAPRO CW KEYBOARD

The HD-8999 UltraPro CW Keyboard, recently developed by Heath Company, is a third generation of code computers. A 64-character type-ahead buffer permits typing faster than the keyboard is sending. Ten variable-length buffers eliminate waste when storing text. Messages stored in the buffers can be compiled, corrected, or transmitted with no more than three keystrokes. A large, four-digit LED display indicates many functions: speed, spacing, weighting, serial number, remaining message-character space, input error, tune mode, sidetone on/off, keyclick, and individual buffer protection. An 8-segment bar graph indicates fullness of the type-ahead buffer. UltraPro parameters can be set from the keyboard, and battery backup of the CMOS memory retains buffer contents and last-used parameters should power fail or the keyboard be turned off. Three different four-level code-practice modes are built in, as are turn-on circuit diagnostics, a sidetone oscillator, and a speaker.

For more details on Heath's HD-8999 UltraPro CW Keyboard, send for the latest, free 104-page Heathkit Catalog. Write to *Heath Company, Dept. 150-355, Benton Harbor MI 49022*. In Canada, write to *Heath Company, 1020 Islington Avenue, Dept. 3100, Toronto, Ontario M8Z 5Z3*. Reader Service number 479.

TELEX/HY-GAIN ANNOUNCES HOT LINE

Minneapolis—Telex/Hy-Gain has installed a toll-free customer-service hot line for amateur-radio products. In the continental US, the number is (800)-328-5652. In Minnesota, the number to dial is (612)-887-5528. Calls will be accepted during normal business hours, Monday through Friday, 8:00 am to 5:00 pm, central time.

The company stated that the toll-free number is good only for calls concerning amateur-radio products. The purpose of the service is to assist amateurs with product selections and to help answer

Model 4030 from Bird Electronic Corporation.

The Heath HD-8999 UltraPro CW Keyboard.

questions about applications or installations. The toll-free service is effective immediately.

For more information, contact *Telex Communications, Inc., 9600 Aldrich Ave. So., Minneapolis MN 55420; (612)-884-4051; telex, 29-7053.*

CENTURY/22 CW TRANSCEIVER

Ten-Tec has announced the Century/22, a 6-band CW transceiver. Premiered at Dayton, the new rig was scheduled for production in July. A worthy successor to the popular Century/21, the Century/22 fills the need for a reliable, low-power, no-frills yet effective HF CW transceiver.

For more information, contact *Ten-Tec, Inc., Highway 411 E., Sevierville TN 37862; (615)-453-7172.*

Ten-Tec's Century/22 CW transceiver.

DESIGN ELECTRONICS OHIO T/R SWITCH

Design Electronics Ohio has announced the introduction of the QSK 1500, an all-solid-state, American-made T/R switch which uses state-of-the-art high-power pin diodes for ultra-fast silent switching. The installation of the QSK 1500 between a QSK (full break-in) transceiver and any linear amplifier (including home-brew) allows full break-in QSK CW operation at the 1500-Watt power level. In addition, it also allows the operation of high-power AMTOR with any amplifier.

Since the QSK 1500 uses pin diodes instead of vacuum relays, its operation is totally silent. Installation requires no modifications to either your QSK transceiver or your amplifier. Because of its broadband design, the 1500 will operate from 1.8 MHz to 30 MHz without any additional switches or controls to adjust.

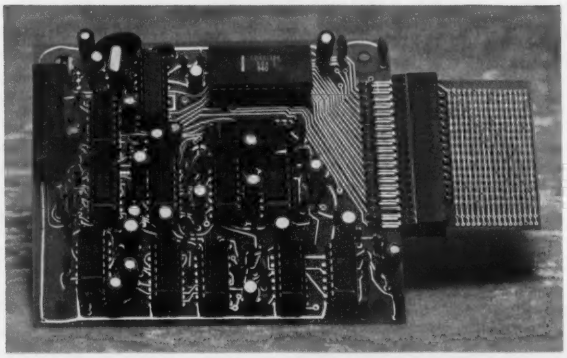
The external QSK T/R switch has virtually no insertion loss on receive and does not degrade the front-end performance of any transceiver. Guaranteed insertion loss is less than 0.6 dB and typical insertion loss is 0.25 dB.

The QSK 1500 includes at no extra cost a custom-designed power supply and control panel plus a receiver-line protection circuit which prevents damage to the front end of solid-state QSK transceivers due to the presence of high-power rf fields (such as multi-contest operations or nearby amateurs running high power).

Installation of the 1500 does not change the pattern or character of the transmitted waveform, nor does it produce any TVI or electronic garbage over the rest of the spectrum. It will not change the quality of the signal that your QSK transceiver and linear amplifier produce; it only switches your rf and does not alter it.

The QSK 1500 comes as a 2-unit set, color-coordinated to match most popular QSK transceivers. The two units furnished are the rf-switching unit which mounts out of sight behind your operating desk, and the power supply/control unit which is placed at your operating position. After installation, there is only one control associated with the 1500—the on/off switch.

For further information, contact *Design Electronics Ohio, 4925 South Hamilton Road, Groveport OH 43125,* or call *Ralph Rickett at (614)-866-4267.* Reader Service number 478.



The TTC300 touchtone remote-control board from Spectrum Communications Corp.

TTC300 TOUCHTONE™ REMOTE-CONTROL BOARD

The Spectrum Communications Corporation TTC300 is a new DTMF (touchtone) controller board which provides remote DTMF control of virtually any on/off function via a radio or any type of link with audio output (such as wire line or phone line). Typical applications include remote control of functions at a repeater site or any location with a radio line, and industrial controls at plants, pipelines, and construction sites, etc.

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For more information, contact *Spectrum Communications Corp., 1055 W. Germantown Pk., Norristown PA 19401-9616; (215)-631-1710; telex 846-211.* Reader Service number 481.

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73 INTERNATIONAL

from page 60

laration of a Civil Emergency was imminent. At 0345 the CD warning siren system began sounding, but even this system was affected by flooding; only four of the seven sirens were operational. Added to that, only one of the three local radio stations remained on the air after the declaration of the emergency, the other two suffering water damage to studio transmitter cables.

The telephone call-out of AREC personnel to man CD HQ was thwarted because the flooding also had affected some of the telephone circuits. Only two operators were contacted by telephone. After the warning sirens had sounded, some AREC operators came up on the Invercargill 680 repeater and were directed to CD HQ for duties. Around 0415, several AREC operators had arrived at CD headquarters, and all reported having to take numerous detours to get to the headquarters building in the center of the city. Reports were being received through the 680 repeater of operators available but unable to cross the flood waters to get to the central city, so the communications center had to make the best use of the five operators available and hope that others would eventually somehow find a way to headquarters.

By around 0430, a small number of the CD HQ operations staff and emergency liaison officers had arrived and the operation of CD HQ was under way. A Civil Defense vehicle with a radio operator was dispatched to check the extent of the flooding, and information from this reconnaissance and the Emergency Service reports indicated a very serious flooding situation throughout the entire city area.

People evacuated so far were located and cared for in a welfare center opposite CD HQ, so no communications were required to that post. Regular situation reports were being received over the CD communications net on 149 MHz, and a steady flow of reports continued until about 1000 hours when it was reported that an evacuation was to take place in the suburban area of Grasmere. A radio link was set up with the welfare center at Collingwood School, where the evacuees from Grasmere would be taken.

While all this activity was continuing in Invercargill, the surrounding towns and areas in western Southland were experiencing severe flooding and residents were being evacuated. The Invercargill 680 repeater was used as a link between these areas and CD regional HQ, and the AREC communications vehicle was set up at CD HQ to provide ground-to-air communications for the two Air Force Iroquois helicopters being sent by the Air Force to participate in rescue operations with the two civilian helicopters already operating.

About 1400 hours, all hell broke loose as the flood banks on the Waihopai River broke and torrents of water engulfed the northern part of the city, the North Road industrial area, and the South Grasmere residential area. Within 30 minutes the water was six to eight feet deep, covering this large area of the city, and the Collingwood School welfare center was now cut off from the rest of the city.

Because of increased radio traffic, a spare portable VHF set was dispatched to the Collingwood center by 4WD vehicle, and a CD rescue squad was sent to assist in the Grasmere-Collingwood area. The 4WD vehicle and operator arrived at Collingwood almost an hour later, after detouring through Otatara, West Plains, and across country, after many extra miles, when in normal circumstances the journey would have only been about 15 minutes. Shortly after the arrival of the operator at Collingwood, the number of evacuees exceeded 300 and a decision was made to try to move these people to a welfare center established at the Hostel of the Boys High School. A convoy of Army trucks was to be used for this transport task, as the only suitable route was by North Road and this was covered by four to five feet of water.

A civilian radio operator and a VHF set were supplied to the Boys High School welfare center, as there was still a shortage of AREC operators at HQ and by now (1530 hours) the entire city was cut off by flood water from the rest of the country. Radio messages from the two welfare centers, from the rescue squads, and from a rescue jet boat kept the HQ operators extremely busy. Messages were being written on any piece of paper as the supply of message pads had run out and there was no time to go looking for more. About this time, the radio log became the communications center's record of many of the messages sent and received. All messages were unregistered because of the staff shortage, and as most messages required life-saving action, prompt handling was essential. For many of the messages, it was quicker for the operator to get the addressee of the message to the radio—then immediate action and reply followed, with only brief details being recorded in the log.

Around 1600 hours, the Iroquois helicopters arrived and became operational and joined the two commercial helicopters in rescues at Grasmere. Communication with these aircraft was on 119.1 MHz, and this operation fully occupied one HQ AREC operator.

At 1700 hours, floodwaters in the south of the city had dropped enough to allow some replacement AREC operators to report to HQ, and these operators were used to relieve some of the HQ operators who had been on duty for over 12 hours. The emergency operations continued into Friday night, it being necessary for an Iroquois rescue even at 0058 Saturday morning. The four aircraft returned to full air operations again at 0600 hours.

While the south city floodwaters were subsiding during Friday evening, those in the north and west were still rising. Evacuations continued in these areas throughout the night and into the early hours of Saturday morning. At 0600 hours, Saturday, 28 January, a volunteer Army-trained radio operator, now a civilian, arrived to operate the ground-to-air communications. He remained at this set until the next Tuesday, January 31, and did an excellent job. At 0700 hours, a request was received from the airport control tower to change frequency to 118.1 MHz, and as well as ground-to-air communications, CD HQ kept in touch with the airport as the water level rose there until eventually the tower operator had to be evacuated, the airport now being completely flooded.

Communications continued along these lines for the next few days, still with 24-hour operation. Operators were now more plentiful, with the return of AREC members from holiday, and a more civilized shift system could be introduced. Messages had now changed from rescue to welfare-type communications, but the volume had reduced only slightly.

Tuesday, January 31, at 0800 hours, after 100 hours of continuous operation, the emergency was over and it seemed as though we could pack up, when the controller requested 10 hand-helds and operators to accompany the City Health, Electrical, and Building Inspection teams who were examining the evacuated homes to declare them fit for habitation again. These teams had a vital need for communications to coordinate their activities and to provide the Information Center with details so the residents concerned could be kept informed. Most of the evacuated homes had been under six to eight feet of water and, to complicate matters, nearly all had been fouled by sewage due to the breakdown of the sewage system. Most could not be reoccupied until some remedial action was taken.

As many of the Invercargill operators were now back at their own work, it was difficult to see how this request could be filled, so an urgent call to Dunedin AREC for 10 operators with hand-helds and a portable repeater was made. The Dunedin team took over on Wednesday and continued until Sunday, February 4. A massive clean-up was scheduled in the Grassmere area on that Saturday, when 25 trucks, each with an operator with a hand-held controlled by a coordinating center, were arranged. As well as the operators with the trucks, a further 11 operators were assisting with the inspection and welfare operations between the hours of 0800 and 1800, communications being on the two CD VHF frequencies and two 2m frequencies.

Operations were now scaling down until eventually, on Sunday, February 12, all AREC and CD equipment was dismantled, and any communications then necessary continued by telephone.

The size of the flooding disaster was enormous. The amount of damages was several million dollars, and at the peak of the emergency over 3000 people from about 1000 homes were evacuated and housed in welfare centers or with friends and/or relatives. it was to be some time before all those evacuated were able to return to their homes and return to a normal life again. Invercargill is a city of about 56,000 people, and from the statistics, about 5% of the population had to be evacuated from houses inundated by more than four feet of water during the height of the flooding. Other areas in the Southland district were also affected, and also most of the city of Invercargill.

The summary of the radio communications system indicated that it would be advantageous for all Civil Defense headquarters communications centers to have equipment available to operate on the amateur frequencies, so as to allow the large pool of hand-held amateur transceivers and portable equipment to be available for CD communications, since no local CD organization will ever have sufficient equipment of their own to cope with a similar extensive situation. The communications system must be portable and flexible to allow sets to be installed where you least expect it, and a total commitment to type-approved equipment on 148 to 150 MHz will not allow this to happen.

Once again, the Amateur Service has been able to put its expertise to good use in an emergency situation, and although Civil Defense has its own special frequencies, most of the operators in the CD communications system are ZL amateurs. But in this instance, also, because of the extensive nature of the disaster, additional radio assistance was made available through the Amateur Radio Emergency Corps, with additional operators, portable equipment, and the amateur-radio repeater systems within the area of the disaster.

ZL9—AUCKLAND AND CAMPBELL ISLANDS

Last month I told you a bit about the Kermadecs, ZL8. This month I shall try to provide you with a picture of the Campbell Islands.

The Auckland Islands are about 500 km south of the southernmost part of ZL and are uninhabited, except maybe for lots of penguins and seals. So there is not very much chance of a contact with the Auckland Islands unless some amateur visits the islands for some obscure reason. However, the Campbell Islands are a different kettle of fish. Campbell Island, situated 52° 33' S, 169° 8' E in the South Pacific Ocean, covers an area of 114 square km and is about 48 km in circumference. The island is semicircular, has good harbors, and is now a manned weather station, playing an important part in the forecasting of New Zealand weather.

Prior to this, it was used as a coast-watching station during World War II, and the history books tell us Campbell Island's first settlers arrived in the early 1800s. Activities on the island included sealing and whaling, and in later years a sheep station was established.

As a weather station, there normally are about 10 people there at any one time, and the normal stay is 12 months (from November to November). A typical island crew is an officer in charge, a cook, a mechanic, four Met personnel, and three technicians.

Besides three hourly weather observations and two radiosonde balloon flights each day, Department of Scientific and Industrial Research observations of a more technical nature are made. These consist of a close examination, at 15-minute intervals, of the ionosphere's layers, riometer recordings (relative ionospheric opacity receivers) observing ionospheric noise at 30 MHz, variations in the magnetic field (which is quite considerable at this latitude), and VLF recordings using a delta loop made for Otago University.

Auroral displays are quite common at Campbell, and a 16mm all-sky camera operates every night taking one exposure every five minutes to record the event, though on many nights an abundance of clouds makes it difficult even for an amateur photographer. Continuous seismological recordings also are made at Campbell.

The technicians process the magnetic and seismo records once each week, and the results are then sent by radiotelephone to Christchurch.

From time to time, amateur-radio operators are amongst the technicians who are down at Campbell Island for their year's term, the last one being John Holtum ZL3HI/A, a Grade II operator, who was active on 80-meter phone and CW as well as 2 meters. John was at Campbell during 1982/83.

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The SP DX Club in Poland celebrates 25

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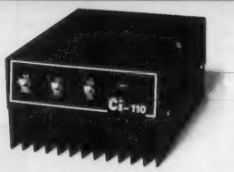

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years of activity. After one year of stagnation, the SP DX Contest took place in 1983. The best foreign radio stations:

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UB5BBT	3.5 MHz
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UA9AHS	21 MHz
UL7BBW	28 MHz

The best Polish stations:

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SP3KEY	189,334 points
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SP7KTE	105,360

SOMB Category

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SP9EVP	77,805
SP9ADV	65,591

Polish Monoband Category

SP1ADM	3.5 MHz
SP9EWN	7 MHz
SP2AYC	14 MHz
SP9CDA	21 MHz
SP6FBK	28 MHz

The International Commission of PRAA (Polish Radio Amateurs Association) has its hands full. The congress of the First Region of IARU took place in Sicily this year. Many documents and suggestions have been prepared for the Executive Committee of IARU, the Ministry of Communications, and Headquarters of PRAA. As delegates to the congress of IARU were appointed SP5LVV, SP5HS, SP5BFW, and SP6ARE. The chairman of the EMC team is to be SP9ZD. As a candidate for Executive Committee of the First Region of IARU, Wojciech Nietyksza SP5FM has been proposed. In connection with the World Year of Telecommunication, the State Radio Surveillance gave its consent to have 10 Polish radio stations under the WCY banner.

The following contests are included among "Intercontest KF 1984" in Poland this year:

- SP DX Contest (SSB)—April 7–8.
- WPX Contest (CW)—May 26–27.
- *CQ* MIR—May 8–9.
- All Asian Contest (SSB)—June 16–17.
- IARU Radiosport—July 14–15.
- WAE DX Contest (CW)—August 11–12.
- All Asian Contest (CW)—August 25–26.
- WAE DX Contest (SSB)—September 8–9.
- *CQ* WW DX Contest (SSB)—October 27–28.
- *CQ* WW DX Contest (CW)—November 24–25.

The President of PRAA, Prof. A. Zielinski, sent a telegram of condolence to the ARRL because of the death of the President of the ARRL, Vic Clark W4KFC, a well-known in Poland American sender.

Lately it was announced that District Verification Boards had brought 2,860 individual and 193 club licenses up to date by the end of November, 1983. This is not many in comparison with the about 12,000 Polish radio amateurs.

PORTUGAL

Luiz Miguel de Sousa CT4UE
PO Box 32
S. Joao do Estoril
2765 Portugal

We shouldn't have any doubts that *73* is a magazine read all over the world, according to the letters kindly sent to me in the past weeks by CT1AGC/Panama, CT1DN/CR9, DL2MCM, G4VUB, PT2ZAI (who came last March), PY4LF, N9DZO (who called me from REP Headquarters), W1BFA, W4DGA, KA1EWT, W1TIV, and others. For all of them, my sincere thanks.

IFACTA 84 PORTUGAL

Last March, on the 25th, for a period of one week, a very important meeting was held in the Estoril Sol Hotel (Estoril). Ernie Bracy W1BFA, who came for the conference, too, left us a report concerning that event, as follows.

Rede dos Emissores Portugueses (REP) was host amateur-radio station for the annual conference of the International Federation of Air Traffic Control Associations and took its place among others in welcoming the air-traffic-control people to Portugal. Other participants included the President of Portugal, the Minister of Social Equipment, the Mayor of Cascais, the General Tourist Office, and the public corporation, Aeroportos e Navagacao Aeria (ANA).

Each year W1BFA operates an amateur-radio station in conjunction with the conference. (Last year's operation was in Yugoslavia and the callsign was 4N0ATC-W1BFA/YU2).

Ernie arrived in Portugal on March 24th. It was a windy, showery day. However, amid high gusts of wind and downpours of rain, he and I installed a mini-beam (HQ1) on a superstructure on the top of the Hotel Sol Estoril, the equivalent of 20 stories in the air. A top-floor room had been reserved, but at the last minute it became unavailable. On Sunday, the 25th, Ernie ran the cables down to the 12th floor and put the FT-902DM T/R loaned by REP on the air. It was just in time to make a few WPX Contest QSOs and check out the coverage.

Daily, during the conference, station CT1REP/W1BFA was utilized as the Net Control Station for the International Air-Traffic-Control Net which operates on 14.277 kHz 10:30–12:30 UTC. (Last year the net had 900 stations check in; it supports a regular membership of over 100 stations.) The net is made up of air-traffic controllers, pilots, aviation technicians of various categories, and aviation-interested people. Additional information can be obtained from W1BFA, net controller.

Contacts during the week were maintained with some 30 countries in spite of the poor propagation. The IFATCA Conference was attended by people from nearly 50 countries. In addition to W1BFA, EI4BK, a G operator, and TF3MXN were in attendance.

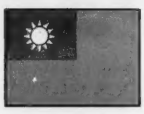
Ernie W1BFA expressed his warm, heartfelt appreciation to REP for the loan of the equipment and for giving permission for the operation in Portugal.

ELECTIONS IN REP

On the 31st of March, the annual General Assembly was held in Lisbon to approve the accounts and to elect a new board of directors for 1984/85. Due to the absence of candidate lists, the Assembly elected an administrative commission of 5 members who should prepare for new elections in a year's time. We are sure that the new members will continue the hard and exhaustive work that is involved in an association such as REP and all the important affairs, like reciprocal foreign licenses, info for new hams, QSL bureau, periodical information sheets, etc.

That's all from this sunny and warm country. *73* until next time.

W1BFA operating CT1REP from his Estoril hotel. (Photo by CT4UE)



TAIWAN

Tim Chen BV2A/BV2B
PO Box 30-547
Taipei, Taiwan
Republic of China

A group of European hams consisting of PA/OH/SM was scheduled to arrive in Taipei for 7 days of operating from April 16 through 23, 1984. The group was granted the special callsign BV0AA instead of BV0DX as previously reported.

Gerben PA0GAM, who initiated the DX-pedition application, arrived in Taipei on April 16 with his IC-740, amplifier (GLA1000), and a tribander vertical. Gerben advised us that SM0GMG had not embarked on the airplane because of his father's illness. Poor Lars! He missed the trip and so did not come up in the BV0AA's logs; we are greatly distressed that this

OH2BH (left) and PA0GAM at BV0AA.

Left to right: L. C. Huang (CRA Deputy Secretary), Matti OH2BH, Gerben PA0GAM, Michio JA1MIN, and me (Tim BV2A/BV2B).

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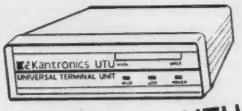

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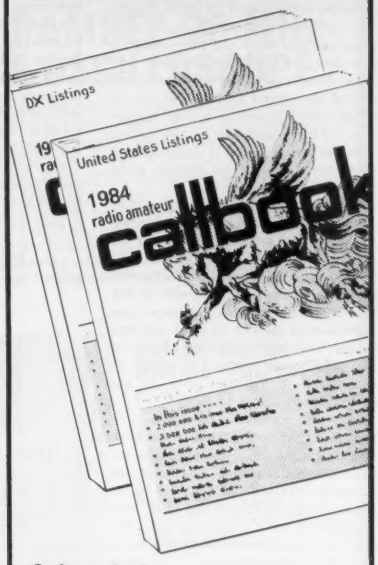

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happened to him. Matti OH2BH arrived two days later, bringing along with him two transceivers (FT-757GX), amplifier (FL2001), and a Hy-Gain 2-element beam. Matti picked up Michio JA1MIN to replace SM0GMG in the group.

Under the bright moon, the group started promptly to erect the beam antenna for the betterment of DX QSOs. The job was completed very quickly as the mast pipes and guy wires had been ready for use. Everyone showed enthusiasm and close cooperation to commemorate the special day—World Amateur Day—in addition to their DXpedition activity. Incidentally, OM Barry Goldwater K7UGA, visiting here, had been informed of the DXpedition so he could enjoy some relaxing along with his busy official duties.

Last year, I reported in detail the DXpedition of the Italian Blue Team, and following that many are still questioning me about the possibility of visitors operating in this country and how to get the permission. Yes, it was a problem with us, but now Chinese authorities in Taiwan have granted three permits to three different groups. Individual visitors can be permitted to work as "second operator" at BV2A/BV2B. It indicates that we are agreeing to the ham's activities.

What will be next? The Chinese authorities have gradually granted more privileges to group visitors; they are allowed to use 7 MHz besides the 10-, 15-, and 20-meter bands. 144 and 430 MHz will be allowed for the next DXpedition group, then scheduled to arrive in Taipei on June 8th. The PA/OH/JA operators of BV0AA had a nice score of approximately 12,100 QSOs covering 77 countries during the week of operation on the frequencies mentioned above. The outcome was considered good as propagation was FB.

As before, all visitors relaxed after their task was over and were entertained with sightseeing and a dinner party given by the China Radio Association (CRA), where they were met by many VIPs and old old-timers.

Representing NCDXF, OH2BH presented to CRA a 2-element beam antenna to foster goodwill and to promote more ham activities in this country. We thank the NCDXF for its thoughtful plan! Also, we are happy to own an FT-757GX and FL2001 amplifier left behind by the expedition group at our request. Together with the beam antenna, we have pledged to establish a third BV station in this city. I am happily accepting a membership in NCDXF, by the recommendations of PA0GAM and OH2BH.

The last two expedition groups have shown us something different in radio-operating technique; all visitors are very skillful and well-disciplined. Also they brought in new amateur-radio equipment, synthesized, compact, and efficient, and often gave surprises to other users who also are quite interested in electronic technology.

A local newspaper reported on this friendliness, saying that it made the public more informed of the unique quality of world amateurs. China Radio had a 15-minute program introducing amateur radio through its nationwide net. One of the local TV stations approached us for an interview, but a little too late.

Another DXpedition, from Japan, is (as I write) arriving soon; the callsign will be BV0AB or BV0JA.

FLASH! The Chinese authorities have decided to grant 10–12 ham-station licenses in the near future! I will report the details later.

TRINIDAD AND TOBAGO

John L. Webster 9Y4JW
c/o Department of Soil Science
University of the West Indies
St. Augustine
Trinidad
West Indies

THE 9Y-8P-LINK REPEATER PROJECT

This month we will look at an experimental project in which the TTARS and the Amateur Radio Society of Barbados (ARSB) have been jointly participating—the 9Y-8P-Link Repeater Project.

During the first half of 1983, this project, which had been in the planning stage for several years, finally became a reality, and the islands of Barbados and Trinidad were linked via the two-meter band.

This VHF repeater system is the first stage in a plan to link all of the Caribbean islands on 2m and is being used as the proving ground for the plan. Such a VHF link is desirable between the islands especially in times of emergency and disaster. Many of the Caribbean islands are vulnerable to the hurricanes that can, and often do, appear in this area during the period June to October. During these times, the islanders often have to rely on amateur radio as their only means of reliable communications.

The importance of having well-equipped and organized amateur-radio operators may easily be seen if you were to review the disaster that engulfed the island of Dominica when hurricane David wreaked havoc there for 8 hours on August 30, 1979. The following year it was St. Lucia's turn to suffer a similar fate with the passage of hurricane Allen. In both cases, amateur radio played leading roles in bringing relief to the affected communities, and they have been reported in the pages of *73*—the Dominica disaster in the May, 1980, issue by myself, under the title "Hurricane." The planned link repeater system is part of the ongoing effort to improve emergency communications throughout the region while at the same time enhancing our day-to-day contact with our neighbors. In the following paragraphs, I shall give a description of the system as it currently is (May, 1984) and comment on its success to date.

On the Barbados end of the link, the repeater site is located at Mount Misery; at 329 meters above sea level (ASL), it is the second highest point on the island. Mount Misery is actually the location for one of the communication centers of Barbados External Telecommunications, Ltd., (BETL)—formerly Cable & Wireless—the company that handles international communications for the island. BETL kindly allowed the ARSB the use of the site and space on one of their 62m towers.

The repeater is a Yaesu FTR-2410 with an input on 144.710 MHz and output on 145.310 MHz. The antennas used are a pair of Ringo Rangers with a vertical separation of 22 meters. The receive antenna is located at 54 meters above ground level (AGL) and the transmit antenna at 32 meters AGL. In addition to being the link repeater, it also serves as a secondary (or backup) repeater for the island, should the primary system on 146.310/.910 MHz fail.

The link to the Trinidad repeater is effected with an Icom IC-290. This transceiver drives an 80-Watt amplifier into a 15-element vertically-polarized yagi 20 meters AGL, pointed at Trinidad. The IC-290 transmits on 147.330 MHz and receives on 147.930 MHz—the frequencies used by the 9Y repeater. The IC-290 is interfaced to the 8P repeater via a homebrew interface designed and constructed by Ron Armstrong 8P6BN.

On the Trinidad end of the link, a Yaesu FTR-2410 repeater also is in use, driving a 100-Watt amplifier into a 4 × 4 element yagi array. The site is on Cumberland Hill in the northwestern part of the island. The location is 548 meters ASL and we have been provided space on a 62-meter tower through the kind courtesy of the local TV station. The antennas are located at the 46-meter level.

The system operates as follows. When a signal is received by the Barbados repeater on 144.710 MHz, it keys up that repeater and the signal is broadcast locally on 145.310 MHz. The interface interconnecting the BP repeater and the IC-290 also senses this signal and puts the IC-290 into the transmit mode, sending this signal across the Caribbean Sea to Trinidad on 147.330 MHz. The transmission is received by the 9Y repeater and simultaneously rebroadcast on 147.930 MHz for the reception of Trinidadian hams. When the signal being received by the 8P repeater on 144.710 MHz ceases, the interface unit returns the IC-290 to receive mode, and the 9Y repeater also returns to the standby mode.

When a signal from the 9Y end keys up the 9Y machine, the 147.930-MHz output signal is received by the IC-290 in Barbados. This triggers the interface unit which switches on the 8P machine, and the original transmission is then simultaneously rebroadcast in Barbados on 145.310 MHz.

The distance between the two repeater sites is about 338 km, and with the antennas at each end being less than 600 meters ASL, it can be seen that this is a very long path for reliable VHF communications. This fact has made itself evident over the past 10 months or so, and the reliability of communication via the system has often left much to be desired. There is much multi-path fading which, after the original novelty had worn off, has rendered operation through the system a frustrating experience. Many QSOs were had on the "ups" in the pathway, but only the patient operator waited through the "downs" to continue the QSO on the next "up"!

The system as originally set up has proven unsuitable in its original objective and an alternative plan has been pressed into operation. On March 10, 1984, the technical officers of the ARSB (8P6BN and 8P6FV) changed the link transceiver over to the J3 repeater on the island of Grenada. This repeater operates on 146.160/.760 MHz. Grenada, due to its geographical location, forms a most suitable stepping stone to break the lengthy path between Barbados and Trinidad.

As I write this, the new system has been in use for about six weeks and has met with very good success. It has allowed reliable communications between hams located on the islands of Barbados, Grenada, St. Vincent and the Grenadines, Trinidad, St. Lucia, and even some of the islands further north. In order to access this new system then, which is now a J3-8P link, stations must access either the J3 or the 8P repeater as the 9Y repeater is no longer a part of the system. On the Trinidad end, therefore, this has resulted in very restricted access to the system, mainly on account of the Northern Range, a mountain range with highest peaks of just over 1000 meters, that is along the entire northern coast of the island. As a result, only a few stations in ideal locations on Trinidad, running higher power (100 W and up) into multi-element directional antenna systems, are able to access the J3 repeater and get into the new link. Later this year it is hoped to install an interface unit similar to the one used in Barbados to link the J3 and 9Y repeaters. It is expected that when this is completed, all 9Y stations will have access to the link.

The ARSB has plans to improve the installation by the acquisition of a set of duplexers to relieve some desensing and intermodulation problems that have plagued their end from time to time. It is interesting to note that since the change has been made linking the J3 and 8P repeaters, the amplifier on the Barbados end has been cut off and the repeater run barefoot—just 10 W or approximately 500 W erp—and reliable two-way communications have been maintained.

PUBLIC SERVICE ASSISTANCE

On March 25, 1984, the TTARS provided the communications necessary for an International Go-Kart Race Meeting. The meeting was sponsored by the local Karting Club at the Go-Kart track at Chaguaramas on the northwestern peninsula of the island. This sport has recently been revived in Trinidad, and the organizers, seeking a reliable communication network, approached the TTARS for assistance. The TTARS members who volunteered their services were treated to a day of thrills but few spills, while at the same time assisting with the smooth running of the event. The 9Y participants included -4M, -HM, -WG, -VAN, and -GR.

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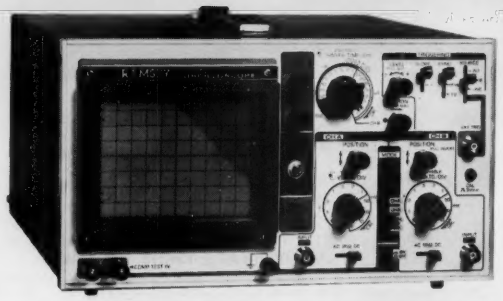

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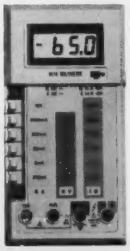

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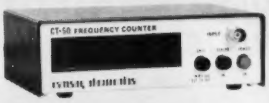

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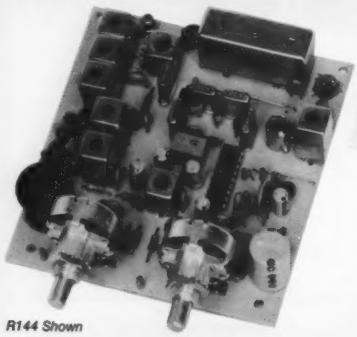

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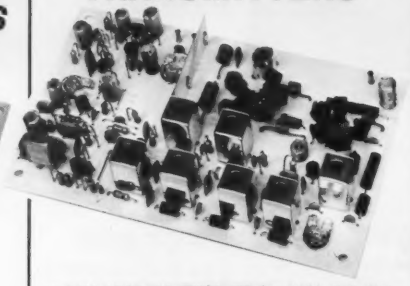
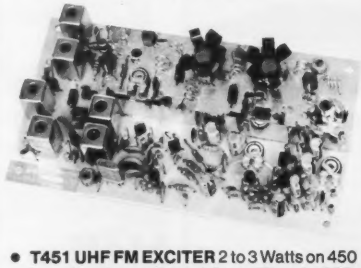
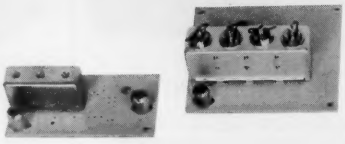


- **T51 VHF FM EXCITER** for 10M, 6M, 2M, 220 MHz or adjacent bands. 2 Watts continuous, up to 2½ W intermittent. $68/kit.



- **T451 UHF FM EXCITER** 2 to 3 Watts on 450 ham band or adjacent freq. Kit only $78.
- **VHF & UHF LINEAR AMPLIFIERS.** Use on either FM or SSB. Power levels from 10 to 45 Watts to go with exciters & xmtg converters. Several models. Kits from $78.
- **A16 RF TIGHT BOX** Deep drawn alum. case with tight cover and no seams. 7 x 8 x 2 inches. Designed especially for repeaters. $20.

ACCESSORIES



- **HELICAL RESONATOR FILTERS** available separately on pcb w/connectors.
  HRF-144 for 143-150 MHz $38
  HRF-220 for 213-233 MHz $38
  HRF-432 for 420-450 MHz $48
- **COR-2 KIT** With audio mixer, local speaker amplifier, tail & time-out timers. Only $38.
- **COR-3 KIT** as above, but with "courtesy beep". Only $58.
- **CWID KITS** 158 bits, field programmable, clean audio, rugged TTL logic. Kit only $68.
- **DTMF DECODER/CONTROLLER KITS.** Control 2 separate on/off functions with touchtones®, e.g., repeater and autopatch. Use with main or aux. receiver or with Autopatch. Only $90
- **AUTOPATCH KITS.** Provide repeater autopatch, reverse patch, phone line remote control of repeater, secondary control via repeater receiver. Many other features. Only $90. Requires DTMF Module.
- **NEW – SIMPLEX AUTOPATCH** Use with any transceiver. System includes DTMF & Autopatch modules above and new Timing module to provide simplex autopatch and reverse autopatch. Complete patch system only $200/kit. Call or write for details.

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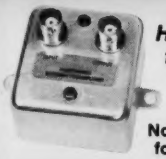
NEW LOW-NOISE PREAMPS



Hamtronics Breaks the Price Barrier!

*

No Need to Pay $80 to $125 for a GaAs FET Preamp.

FEATURES:

- Very Low Noise: 0.7 dB VHF, 0.8 dB UHF
- High Gain: 18 to 28 dB, Depending on Freq.
- Wide Dynamic Range for Overload Resistance
- Latest Dual-gate GaAs FET, Stable Over Wide Range of Conditions
- Rugged, Diode-protected Transistors
- Easy to Tune
- Operates on Standard 12 to 14 Vdc Supply
- Can be Tower Mounted

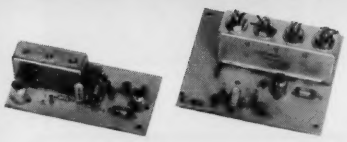
MODEL	TUNES RANGE	PRICE
LNG-28	26-30 MHz	$49
LNG-50	46-56 MHz	$49
LNG-144	137-150 MHz	$49
LNG-220	210-230 MHz	$49
LNG-432	400-470 MHz	$49
LNG-40	30-46 MHz	$64
LNG-160	150-172 MHz	$64

ECONOMY PREAMPS

Our traditional preamps, proven in years of service. Over 20,000 in use throughout the world. Tuneable over narrow range. Specify exact freq. band needed. Gain 16-20 dB. NF = 2 dB or less. VHF units available 27 to 300 MHz. UHF units available 300 to 650 MHz.

- P30K, VHF Kit less case $18
- P30W, VHF Wired/Tested $33
- P432K, UHF Kit less case $21
- P432W, UHF Wired/Tested $36

HELICAL RESONATOR PREAMPS



Our lab has developed a new line of low-noise receiver preamps with helical resonator filters built in. The combination of a low noise amplifier and the sharp selectivity of a 3 or 4 section helical resonator provides increased sensitivity while reducing intermod and cross-band interference in critical applications. See selectivity curves at right. Gain = approx.12 dB.

Model	Tuning Range	Price
HRA-144	143-150 MHz	$49
HRA-220	213-233 MHz	$49
HRA-432	420-450 MHz	$59
HRA-( )	150-174MHz	$69
HRA-( )	450-470 MHz	$79

RECEIVING CONVERTERS

Models to cover every practical rf & if range to listen to SSB, FM, ATV, etc. NF = 2 dB or less.

	Antenna Input Range	Receiver Output
VHF MODELS	28-32	144-148
	50-52	28-30
Kit with Case $49	50-54	144-148
Less Case $39	144-146	28-30
Wired $69	145-147	28-30
	144-144.4	27-27.4
	146-148	28-30
	144-148	50-54
	220-222	28-30
	220-224	144-148
	222-226	144-148
	220-224	50-54
	222-224	28-30
UHF MODELS	432-434	28-30
	435-437	28-30
Kit with Case $59	432-436	144-148
Less Case $49	432-436	50-54
Wired $75	439.25	61.25

SCANNER CONVERTERS Copy 72-76, 135-144, 240-270, 400-420, or 806-894 MHz bands on any scanner. Wired/tested Only $88.

SAVE A BUNDLE ON VHF FM TRANSCEIVERS!

FM-5 PC Board Kit – **ONLY $178** complete with controls, heatsink, etc. 10 Watts, 5 Channels, for 2M or 220 MHz.

Cabinet Kit, complete with speaker, knobs, connectors, hardware. Only $60.

REPEAT OF A SELLOUT!

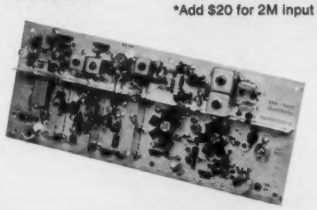
While supply lasts, get $60 cabinet kit free when you buy an FM-5 Transceiver kit. Where else can you get a complete transceiver for only $178

TRANSMIT CONVERTERS

For SSB, CW, ATV, FM, etc. Why pay big bucks for a multi mode rig for each band? Can be linked with receive converters for transceive. 2 Watts output vhf, 1 Watt uhf.

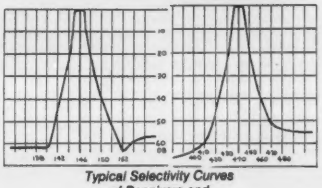
	Exciter Input Range	Antenna Output
For VHF,	28-30	144-146
Model XV2	28-29	145-146
Kit $79	28-30	50-52
Wired $149	27-27.4	144-144.4
(Specify band)	28-30	220-222*
	50-54	220-224
	144-146	50-52
	50-54	144-148
	144-146	28-30
For UHF,	28-30	432-434
Model XV4	28-30	435-437
Kit $99	50-54	432-436
Wired $169	61.25	439.25
	144-148	432-436*

*Add $20 for 2M input



VHF & UHF LINEAR AMPLIFIERS. Use with above. Power levels from 10 to 45 Watts. Several models, kits from $78.

LOOK AT THESE ATTRACTIVE CURVES!



Typical Selectivity Curves of Receivers and Helical Resonators.

IMPORTANT REASONS WHY YOU SHOULD BUY FROM THE VALUE LEADER:

1. *Largest selection of vhf and uhf kits in the world.*
2. *Exceptional quality and low prices due to large volume.*
3. *Fast delivery; most kits shipped same day.*
4. *Complete, professional instruction manuals.*
5. *Prompt factory service available and free phone consultation.*
6. *In business 21 years.*
7. *Sell more repeater modules than all other mfrs. and have for years. Can give quality features for much lower cost.*

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DEALER DIRECTORY

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San Jose CA

Bay area's newest amateur radio store. New & used amateur radio sales & service. We feature Kenwood, ICOM, Azden, Yaesu, Ten-Tec, Santec & many more. **Shaver Radio, Inc., 1775A S. Winchester Blvd., Campbell CA 95008, 370-6665.**

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Complete photovoltaic systems. Amateur radio, repeater, satellite, and computer applications! Call Paul WD8AHO. **Excon Photovoltaics, 27600 Schoolcraft Road, Livonia MI 48150, 523-1850.**

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Kenwood, ICOM, Ten-Tec, Belden, Cushcraft, Larsen, Hustler, ARRL, Hy-Gain, B&W, MFJ, Mirage. New and used equipment. Serving the amateur community since 1942. **Adirondack Electronics, Inc., 1991 Central Avenue, Albany NY 12205, 456-0203** (one mile west of Northway exit 2W).

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Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the November '84 issue must be in our hands by September 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

PROPAGATION

It is with deep sorrow that we note the passing of our good friend John H. Nelson on May 23, 1984.

For 15 years, John had the final word in 73, his propagation forecasts guiding the dreams of DX-ers throughout the world. He will be missed.

THE NEW LOOK AT YAESU

Tired of paying too much for your Ham gear? The new generation of Yaesu high-technology equipment is designed with you in mind! New advances in computer-aided design and robotics manufacture help you save money while being assured of the best... from Yaesu!!!

FT-757GX Line
Affordable Excellence

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Continuous coverage on RX from 500 kHz to 29.99 MHz in 10 Hz steps, with easy modification for MARS TX outside the Ham bands. WARC bands factory installed.

ACCESSORIES FACTORY PACKED
Electronic keyer, 600 Hz CW filter, speech processor, AM and FM units, all-mode squelch, Woodpecker noise blanker, and receiver preamp ... all included in the base price, not expensive options!

FULL PERFORMANCE
Full CW, QSK, full 100 watts output at 100% duty cycle (SSB, CW, FM), and full microprocessor control with dual VFOs, eight memories with bilateral memory, VFO swap, and personal computer (CAT System) compatibility make the FT-757GX a winner, at home or away.

FT-757GX ACCESSORIES
FP-757GX Switching Power Supply, FP-757HD Heavy Duty Power Supply (for 100% duty cycle operation), FC-757AT Automatic Antenna Tuner with Memory, FAS-1-4R Remote Antenna Selector, SP-102 Speaker with Audio Filters, MD-1B8 Desk Mic, MH-1B8 Hand Mic, FIF-232C Computer Interface Module.

FT-203R Line
The Compact Companion

ULTRA-COMPACT DESIGN
Chip components installed by Yaesu's assembly robots significantly reduce circuit board size, resulting in a rugged, reliable transceiver with a weight of only 450g, including the standard FNB-3 battery.

HANDS-FREE VOX
A VOX (voice-actuated transmit) unit is built-in, allowing hands-free operation when the optional YH-2 Headset is used. Ideal for tower work, public safety, or other applications where manual PTT control is inadvisable. Level control provided.

FULL FLEXIBILITY
Built-in S-meter, thumbwheel frequency programming, HI/LOW power switch, busy channel and transmit indicators are standard. DTMF Encoder versions, as well as 220 MHz and 440 MHz lines, are coming soon!

FT-203R ACCESSORIES
FTS-7 CTCSS Module, FBA-5 AA Cell Case, YH-2 Headset, MH-12 Speaker/Mic, FNB-4 High-Capacity Battery, PA-3 Mobile Adapter, MMB-21 Mobile Hanger, NC-15 Quick Charger/AC Adapter, FTT-3 DTMF Keypad.

Next time you're in the market for a better rig, ask about Yaesu. Designed with care and built with pride, your Yaesu will get you through!

Prices and specifications subject to change without notice or obligation.

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TS-430S "Digital DX-terity!"

TS-430S

Digital DX-terity...that outstanding attribute built into every KENWOOD TS-430S that lets you QSY from band to band, frequency to frequency, and from mode to mode with the speed and ease that will give you a dominant position in DX operations.

KENWOOD'S TS-430S, a revolutionary, ultra-compact, HF transceiver has already won the hearts of radio Amateurs the world over. It covers 160-10 meters, including the new WARC bands (easily modified for HF MARS). Its high dynamic range receiver tunes from 150 kHz-30 MHz. It utilizes an innovative UP conversion PLL circuit for superior frequency stability and accuracy. Two digital VFO's allow fast split-frequency operations. A choice of USB, LSB, CW, or AM, with FM optional, are at the operators fingertips. All Solid-state technology permits inputs of 250 watts PEP on SSB, 200 watts DC on CW, 120 watts on FM (optional), or 60 watts on AM. Final amplifier protection circuits and a cooling fan are built-in.

Eight memories store frequency, mode, and band data, with Lithium battery memory back-up. Memory scan and programmable automatic band scan help speed up operations. An IF shift circuit, a tuneable notch filter, and a Narrow-Wide switch for IF filter selection help eliminate QRM. It has a built-in speech processor. A fluorescent tube digital display makes tuning easy and fast. An all-mode squelch circuit, a noise blanker, and an RF attenuator control help clean up the signal. And there's a VOX circuit, plus semi-break-in, with side-tone. All-in-all, it just could be that the expression "Digital DX-terity" is a bit of an understatement.

TS-430S Optional Accessories: In typical KENWOOD fashion, there are plenty of optional accessories for this great HF transceiver. There is a special power supply, the PS-430. An external speaker, the SP-430, is also available. And the MB-430 mounting bracket is available for mobile operation. The AT-250 automatic antenna tuner was designed primarily with the TS-430S in mind, and for those who prefer to "roll their own," the AT-130 antenna tuner is available. The FM-430 FM unit is available for FM operations. The YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters, the YK-88SN SSB filter, and the YK-88A AM filter may be easily installed for serious DX-ing. An MC-60A deluxe desk microphone, MC-80 and MC-85 communications microphones, an MC-42S mobile hand mic., and an MC-55 8-pin mobile microphone, are available, depending on your requirements. TL-922A linear amplifier (not for CW QSK), SM-220 station monitor, PC-1A phone patch, SW-2000 SWR/power meter 160 ~ 6 meter, SW100A SWR/power/volt meter 160-2m, HS-4, HS-5, HS-6, HS-7 headphones, are also available.

More information on the TS-430S is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

Specifications and prices are subject to change without notice or obligation.